Federal Research and Development Funding: FY2011

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Summary

President Obama has requested $147.696 billion for research and development (R&D) in FY2011, a $343 million (0.2%) increase from the estimated FY2010 R&D funding level of $147.353 million. Congress will play a central role in defining the nation's R&D priorities, especially with respect to two overarching issues: the extent to which the federal R&D investment can grow in the context of increased pressure on discretionary spending and how available funding will be prioritized and allocated. Low or negative growth in the overall R&D investment may require movement of resources across disciplines, programs, or agencies to address priorities. This report will be updated as Congress acts on appropriations bills that include funding for research, development and related funding.

Under the President's request, six federal agencies would receive 94.8% of total federal R&D spending: the Department of Defense (52.5%), Department of Health and Human Services (largely the National Institutes of Health) (21.8%), National Aeronautics and Space Administration (7.4%), Department of Energy (7.6%), National Science Foundation (3.8%), and Department of Agriculture (1.7%). NASA would receive the largest dollar increase for R&D of any agency, $1.700 billion (18.3%) above its FY2010 funding level. The Department of Defense would receive the largest reduction in R&D funding, $3.542 billion (4.4%) below its FY2010 level.

The President's FY2011 request includes: $31.341 billion for basic research, up $1.339 billion (4.5%) from FY2010; $30.276 billion for applied research, up $1.949 billion (6.9%); $81.455 billion for development, down $2.918 billion (3.5%); and $4.624 billion for R&D facilities and equipment, down $27 million (0.6%). The FY2011 request includes funding for three multiagency R&D initiatives: the National Nanotechnology Initiative, $1.776 billion, down $5 million (0.3%); the Networking and Information Technology R&D program, $4.281 billion, down $9 million (0.2%); and the U.S. Global Change Research Program, $2.561 billion, up $439 million (20.7%).

President Obama has requested increases in the R&D budgets of the three agencies that were targeted for doubling in the America COMPETES Act (over seven years) and by President Bush under his American Competitiveness Initiative (over ten years) as measured using FY2006 R&D funding as the baseline. Under President Obama's FY2011 budget, the Department of Energy's Office of Science would receive an increase of $226 million (4.6%), the National Science Foundation's budget would rise by $551 million (8.0%), and funding for the National Institute of Standards and Technology's core research and facilities would grow by $48 million (7.3%).

For the past four years, federal R&D funding and execution has been affected by mechanisms used to complete the annual appropriations process—the year-long continuing resolution for FY2007 (P.L. 110-5) and the combining of multiple regular appropriations bills into the Consolidated Appropriations Act, 2008 for FY2008 (P.L. 110-161), the Omnibus Appropriations Act, 2009 (P.L. 111-8), and the Consolidated Appropriations Act, 2010 (P.L. 111-117). Completion of appropriations after the beginning of each fiscal year may cause agencies to delay or cancel some planned R&D and equipment acquisition.

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Overview

The 111th Congress continues to take a strong interest in the health of the U.S. research and development (R&D) enterprise and in providing sustained support for federal R&D activities. The U.S. government supports a broad range of scientific and engineering research and development. Its purposes include addressing specific concerns, such as national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the scientific and engineering workforce; and strengthening U.S. innovation and competitiveness in the global economy. Most of the R&D funded by the federal government is performed in support of the unique missions of the funding agencies. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the Internet to communications satellites and defenses against disease.

On February 1, 2010, President Obama requested $147.696 billion for R&D in FY2011, a 0.2% increase over the enacted FY2010 R&D funding level of $147.353.[1] The President's proposed FY2011 R&D funding includes an emphasis on increasing funding for the physical sciences and engineering, an effort consistent with the intent of the America COMPETES Act (P.L. 110-69) and President Bush's American Competitiveness Initiative (ACI). President Obama would achieve this objective largely through a 6.6% increase in aggregate funding for the Department of Energy Office of Science, the National Science Foundation, and the Department of Commerce National Institute of Standards and Technology's core laboratory research.

More broadly, in a 2009 speech before members of the National Academy of Sciences, President Obama put forth a goal of increasing the national investment in R&D to more than 3% of the U.S. gross domestic product (GDP). President Obama did not provide details on how this goal might be achieved (e.g., how much would be funded through increases in direct federal R&D funding or through indirect mechanisms such as the research and experimentation tax credit[2]); however doing so likely would require a substantial increase in public and private investment. In 2007, total U.S. R&D expenditures were $397.629 billion,[3] or approximately 2.75% of GDP.[4] Based on 2008 figures, reaching President Obama's 3% goal would require a 8.96% real (above inflation) increase in national R&D funding. Increasing direct federal R&D funding by 8.96% in FY2011 would have required increase of $12.9 billion above President Obama's request.

In addition, advocates for increased federal R&D funding—including President Obama's science advisor, John Holdren—have raised concerns about the potential harm of a "boom-bust" approach to federal R&D funding (i.e., rapid growth in federal R&D funding followed by much slower

[1] Funding levels included in this document are in current dollars unless otherwise noted. Inflation diminishes the purchasing power of federal R&D funds, so an increase that does not equal or exceed the inflation rate may reduce real purchasing power.

[2] The research and experimentation tax credit is referred to frequently as the research and development tax credit or R&D tax credit, through the credit does not apply to development expenditures.

[3] Preliminary estimate of 2009 U.S. R&D expenditures, National Science Foundation, *National Patterns of R&D Resources:2007 Data Update*, NSF 08-318, Arlington, VA, 2008, http://www.nsf.gov/statistics/nsf08318/.

[4] Based on 2008 U.S. GDP of $14,441.4 billion as reported by the U.S. Department of Commerce Bureau of Economic Analysis, *National Income and Product Accounts Table*, Table 1.1.5, http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=5&Freq=Qtr&FirstYear=2007&LastYear=2009.

growth, flat funding, or even decline).[5] The biomedical research community experienced a variety of challenges resulting from such a circumstance following the five-year doubling of the NIH budget that was completed in FY2003. With the NIH doubling came a rapid expansion of the nation's biomedical research infrastructure (e.g., buildings, laboratories, equipment), as well as rapid growth in university faculty hiring, students pursuing biomedical degrees, and grant applications to NIH. After the doubling, however, the agency's budget fell each year in real terms from FY2004 to FY2009. Critics assert a variety of damages of this boom-bust cycle, including interruptions and cancellations of promising research, declining share in the number of NIH grant proposals funded, decreased student interest in pursuing graduate studies, and reduced employment prospects for the large number of biomedical researchers with advanced degrees. According to then-NIH Director Elias Zerhouni, the damages have been particularly acute for early- and mid-career scientists seeking a first or second grant.[6]

Analysis of federal R&D funding is complicated by several factors, including the Obama Administration's omission of congressionally directed spending from the FY2011 budget request and inconsistency among agencies in the reporting of R&D. Another complicating factor for FY2009 and FY2010 is the inclusion of funding for R&D, facilities, and equipment, and related activities in the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5). ARRA funds supplement funding provided to agencies in P.L. 110-329 and P.L. 111-8. Some ARRA funding was spent in FY2009 and in FY2010, and the balance of these funds will be spent in subsequent years. For purposes of this report, unless otherwise noted, comparisons of FY2009 and FY2010 R&D funding do not incorporate funding provided under P.L. 111-5. As a result of these and other factors, the R&D agency figures reported by the White House Office of Management and Budget (OMB) and White House Office of Science and Technology Policy (OSTP), and shown in **Table 1**, may differ somewhat from the agency budget analyses that appear later in this report.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide unique insights.

Agency Perspective

The authorization and appropriations process views federal R&D funding primarily from agency and program perspectives. **Table 1** provides data on R&D by agency for FY2009 (actual), FY2010 (estimate), ARRA, and FY2011 (request) as reported by OMB. Under President Obama's FY2011 budget request, six federal agencies would receive 94.8% of total federal R&D funding: the Department of Defense (DOD), 52.5%; the Department of Health and Human Services (HHS) (primarily the National Institutes of Health (NIH)), 21.8%; the National Aeronautics and Space Administration (NASA), 7.4%; the Department of Energy (DOE), 7.6%; the National Science Foundation (NSF), 3.8%; and the Department of Agriculture (USDA), 1.7%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Departments of

[5] Jennifer Couzin and Greg Miller, "NIH Budget: Boom and Bust," *Science*, vol. 316, no. 5823 (April 2007), pp. 356-361, at http://www.scienceonline.org/cgi/content/full/316/5823/356.

[6] Ibid. For additional information on NIH R&D funding issues, see CRS Report RL33695, *The National Institutes of Health (NIH): Organization, Funding, and Congressional Issues*, by Pamela W. Smith.

Commerce (DOC), Homeland Security (DHS), the Interior (DOI), and Transportation (DOT), as well as the Environmental Protection Agency (EPA). In total, these departments and agencies account for more than 98% of current and requested federal R&D funding.

In his FY2011 budget request, President Obama reiterated his intention to double the federal investment in three key science agencies over a decade from their FY2006 levels: DOE's Office of Science (up 4.6% above the estimated FY2010 level), NSF (up 8.0%), and DOC's National Institute of Standards and Technology (NIST) laboratories and construction funds (up 6.9%).[7] This request essentially continues the American Competitiveness Initiative (ACI) initiated by President Bush to double physical sciences and engineering research in these agencies over 10 years (FY2007-FY2016). In 2007, Congress authorized substantial R&D increases for these agencies under the America COMPETES Act (P.L. 110-69), setting a more aggressive seven-year doubling course.[8]

The largest agency R&D increases in the President's FY2011 request are for NASA, $1.700 billion; the Department of Health and Human Services, $979 million (due primarily to a $956 million increase in R&D funding for NIH); the Department of Energy, $526 million; and the National Science Foundation, $479 million. Under President Obama's FY2011 budget request, DOD R&D funding would be reduced by $3.542 billion, USDA R&D funding would be cut by $143 million, and DHS R&D would fall by $104 million.[9]

Table 1. Federal Research and Development Funding by Agency, FY2009-FY2011

(Budget authority, dollar amounts in millions)

Department/Agency	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request	Dollar Change, 2010 to 2011	Percent Change, 2010 to 2011
Agriculture	2,437	176	2,591	2448	-143	-5.5
Commerce	1,393	576	1,516	1,727	211	13.9
Defense	80,821	300	81,090	77,548	-3,542	-4.4
Energy	10,301	2,967	10,693	11,219	526	4.9
Environmental Protection Agency	559	0	622	651	29	4.7
Health and Human Services	30,595	11,063	31,177	32,156	979	3.1
Homeland Security	1,096	0	1,150	1046	-104	-9.0
Interior	701	74	755	772	17	2.3

[7] Executive Office of the President, Office of Science and Technology Policy, *The President's Plan for Science and Innovation: Doubling Funding for Key Science Agencies in the FY2011 Budget*, February 1, 2010, http://www.whitehouse.gov/sites/default/files/doubling%2011%20final.pdf.

[8] For additional information, see CRS Report RL34328, *America COMPETES Act: Programs, Funding, and Selected Issues*, by Deborah D. Stine.

[9] *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009, available at http://www.ostp.gov/galleries/budget/FY2010RD.pdf.

Department/Agency	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request	Dollar Change, 2010 to 2011	Percent Change, 2010 to 2011
NASA	10,887	790	9,286	10,986	1,700	18.3
National Science Foundation	5,379	2,197	5,092	5,571	479	9.4
Transportation	976	0	1,012	1,018	6	0.6
Veterans Affairs	1,020	0	1,162	1,180	18	1.5
Other	1,153	10	1,207	1,374	167	16.7
Total[a]	**147,318**	**18,153**	**147,353**	**147,696**	**343**	**0.2**

Sources: Executive Office of the President, Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2011*, Table 21-1; Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010.

a. Totals may differ from the sum of the components due to rounding.

Character of Work, Facilities, and Equipment Perspective

Federal R&D funding can also be examined by the character of work it supports—basic research, applied research, and development—and funding provided for facilities and acquisition of major R&D equipment. (See **Table 2.**) President Obama's FY2011 request includes $31.341 billion for basic research, up $1.339 billion (4.5%) from FY2010; $30.276 billion for applied research, up $1.949 billion (6.9%); $81.455 billion for development, down $2.918 billion (3.5%); and $4.624 billion for facilities and equipment, down $27 million (0.6%).

Table 2. Federal Research and Development Funding by Character of Work, Facilities, and Equipment, FY2009-FY2011

(Budget authority, dollar amounts in millions)

	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request	Dollar Change, 2010 to 2011	Percent Change, 2010 to 2011
Basic research	29,583	7,794	30,002	31,341	1,339	4.5
Applied research	29,054	5,385	28,327	30,276	1,949	6.9
Development	83,866	1,482	84,373	81,455	-2,918	-3.5
Facilities & equipment	4,815	3,492	4,651	4,624	-27	-0.6
Total[a]	**147,318**	**18,153**	**147,353**	**147,696**	**343**	**0.2**

Source: Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010.

a. Totals may differ from the sum of the components due to rounding.

Combined Perspective

Combining these perspectives, federal R&D funding can be viewed in terms of each agency's contribution to basic research, applied research, development, and facilities and equipment. (See **Table 3**.) The federal government is the nation's largest supporter of basic research funding an estimated 57% of U.S. basic research in 2008,[10] primarily because the private sector asserts it cannot capture an adequate return on long-term fundamental research investments. In contrast, industry funded only 17.7% of U.S. basic research in 2008. In FY2010, the Department of Health and Human Services, primarily the National Institutes of Health (NIH), accounts for more than half of all federal funding for basic research.[11]

In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 60.8% in 2008, while the federal government accounted for an estimated 32.4%.[12] Among federal agencies, HHS is the largest funder of applied research, accounting for nearly half of all federally funded applied research in FY2010.[13]

Industry also provides the vast majority of funding for development, accounting for an estimated 84.1% in 2008, while the federal government provided an estimated 14.9%.[14] DOD is the primary federal agency funder of development, accounting for 88.5% of total federal development funding in FY2010.[15]

Table 3. Top R&D Funding Agencies by Character of Work, Facilities and Equipment, FY2008-FY2010

(Budget authority, dollar amounts in millions)

	FY2009 Actual[a]	FY2010 Estimate	FY2011 Request
Basic Research			
Health and Human Services	21,140	16,981	17,502
National Science Foundation	6,107	4,291	4,684
Energy	4,505	3,862	4,003
Applied Research			
Health and Human Services	18,836	14,051	14,479
Defense	5,066	4,500	4,479
Energy	3,686	3,131	3,728
Defense	74,100	74,676	70,974

[10] National Science Foundation, *New NSF Estimates Indicate that U.S. R&D Spending Continued to Grow in 2008*, NSF 10-312, January 2010, http://www.nsf.gov/statistics/infbrief/nsf10312/#fn.http://www.nsf.gov/statistics/nsf08318/.

[11] Executive Office of the President, Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Table 5-1, May 2009.

[12] National Science Foundation, *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, 2008, http://www.nsf.gov/statistics/nsf08318/.

[13] Executive Office of the President, Office of Management and Budget, *Analytical Perspectives*, Table 5-1, May 2009.

[14] National Science Foundation, *National Patterns of R&D Resources*, 2008, http://www.nsf.gov/statistics/nsf08318/.

[15] Executive Office of the President, Office of Management and Budget, *Analytical Perspectives*, Table 5-1, May 2009.

	FY2009 Actual[a]	FY2010 Estimate	FY2011 Request
NASA	6,677	5,452	6,126
Energy	3,050	2,612	2,560
Facilities and Equipment			
NASA	2,180	2,267	2,547
Energy	2,027	1,088	928
National Science Foundation	998	458	452

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2011*, Office of Management and Budget, The White House, February 2010.

Note: Top funding agencies based on FY2011 request.

a. The amounts for FY2009 include funding from P.L. 111-5, the American Recovery and Reinvestment Act of 2009.

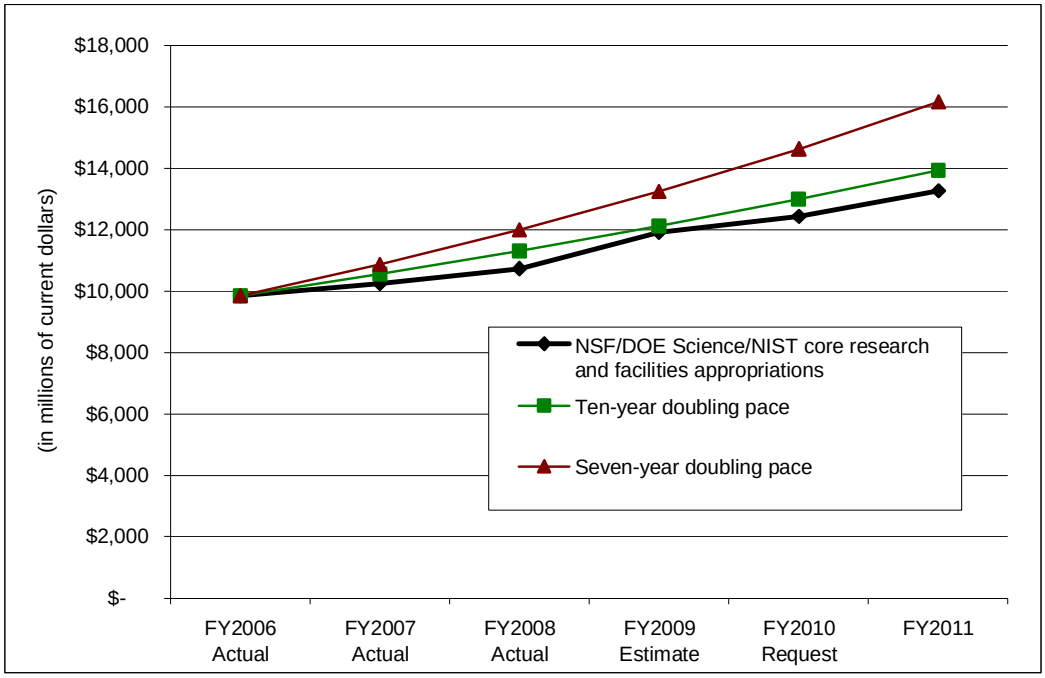
Multiagency R&D Initiatives Perspective

Federal R&D funding can also be viewed in terms of multiagency efforts, such as the National Nanotechnology Initiative (see "Multiagency R&D Initiatives" below), and presidential initiatives, such as the Bush Administration's American Competitiveness Initiative (ACI).

President Obama stated that he would seek to double funding for basic research over 10 years at the agencies comprising the ACI—NSF, DOE's Office of Science, and NIST. Congress established authorization levels for FY2008-FY2010 in the America COMPETES Act that would put funding for research at these agencies on track to double in approximately seven years. However, FY2008 research funding provided in the Consolidated Appropriations Act, 2008 (P.L. 110-161) for these agencies fell below these targets. **Figure 1** illustrates how actual, estimated, and requested appropriations (for FY2006 through FY2011) compare to seven- and ten-year doubling rates.

For FY2011, President Obama has proposed $13.255 billion in funding for NSF, DOE's Office of Science, and NIST's core research and facilities, an increase of $824 million (6.6%) above the FY2010 estimated funding level of $12.431 billion. For FY2010, Congress appropriated an estimated $12.431 billion in funding for these agencies, an increase of $522 million (11.0%) above the FY2009 level of $11.909 billion. The American Recovery and Reinvestment Act of 2009 (P.L. 111-5) also provides funding for each of the three ACI agencies totaling approximately $5.202 billion (in addition to the enacted levels in P.L. 110-329). (See **Table 4**.)

Figure 1. Doubling of Research Funding: Appropriations versus Selected Rates



Source: Prepared by the Congressional Research Service (CRS) using data from the sources cited in Table 4; appropriations data does not include funding providing by the American Recovery and Reinvestment Act of 2009.

Notes: The ten-year doubling pace assumes annual increases of 7.2% each year for ten years. The seven-year double pace assumes annual increases of 10.4% each year for seven years. Through compounding, these rates achieve the doubling of funding in the desired time period. The line passing through the aggregate agency appropriations data points is for illustration purposes only.

Table 4. Agencies Targeted for Research Doubling by President Obama, the America COMPETES Act, and the American Competitiveness Initiative

(dollar amounts in millions)

Agency	FY2006 Actual	FY2007 Actual	FY2008 Actual	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request
National Science Foundation	5,646	5,917	6,092	6,490	3,002	6,873	7,424
Department of Energy/Office of Science	3,632	3,836	4,036	4,773	1,600	4,895	5,121
National Institute of Standards and Technology/core research[a]	395	434	441	472	240	515	585
National Institute of Standards and Technology/facilities	174	59	160	172	360	147	125
Total[b]	9,846	10,246	10,731	11,907	5,182	12,638	13,255

Sources: Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010; National Institute of Standards and Technology, *Fiscal Year 2011 NIST Budget Submission to Congress,* , February 2010; National Institute of Standards and Technology, *Fiscal Year 2010 NIST Budget Submission to Congress,* May 2009; CRS Report 95-30, *The National Institute of Standards and Technology: An Appropriations Overview*, by Wendy H. Schacht; Department of Energy, *FY2008 Department of Energy Budget Request to Congress,*

February 2008; Department of Energy, *FY2009 Department of Energy Budget Request to Congress,* February 2008; National Institute of Standards and Technology, *NIST Appropriations Summary, FY2006-2008;* National Science Foundation, *NSF Summary Tables, FY2008 Budget Request to Congress,* February 5, 2007.

a. NIST core research activities are those performed under its Scientific and Technical Research and Services account.

b. Totals may differ from the sum of the components due to rounding.

Multiagency R&D Initiatives

National Nanotechnology Initiative

President Obama's FY2011 budget request provides funding for three multiagency R&D initiatives. Funding for the National Nanotechnology Initiative (NNI) is requested in the amount of $1.776 billion for FY2011, $5 million (0.3%) below the estimated FY2010 level of $1.781 billion. The overall decrease in the FY2011 NNI funding request is due primarily to reductions of $87 million (20.0%) in funding for DOD nanotechnology R&D compared to its estimated FY2010 funding level, a decrease of $17 million (4.1%) in funding for NSF, and a decrease of $6 million (5.3%) in funding for NIST. These decreases are offset, in part, by increases in funding for other agencies, primarily DOE (up $65 million, 17.4%) and HHS[16] (up $36 million, 9.5%).[17]

Networking and Information Technology Research and Development Program

President Obama is requesting $4.281 billion in FY2011 funding for the Networking and Information Technology Research and Development (NITRD) program, $9 million (0.2%) below the estimated FY2010 level of $4.290 billion. The NITRD request includes a reduction of $171 million (13.4%) in DOD funding, and increases of $80 million (7.3%) for NSF, $38 million (3.1%) for HHS, $29 million (5.9%) for DOE, and $15 million (14.4%) for DOC. [18]

U.S. Global Change Research Program

President Obama has proposed $2.561 billion for the U.S. Global Change Research Program (USGCRP) in FY2010, $439 million (20.7%) above the estimated FY2010 level of $2.122 billion. Four agencies would receive the bulk of the FY2010 USGCRP funding increase: NASA (up $214 million, 20.0%); DOC, including the National Oceanic and Atmospheric Administration

[16] HHS NNI R&D funding includes funding for NIH, the Food and Drug Administration, and the Centers for Disease Control and Prevention.

[17] Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010. For additional information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by John F. Sargent Jr.

[18] Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation*, February 1, 2010.

and NIST (up $77 million, 21.4%); NSF (up $51 million, 16.0%); and USDA (up $48 million, 44.0%).[19]

Department of Defense[20]

Congress supports research and development in the Department of Defense (DOD) through its Research, Development, Test, and Evaluation (RDT&E) appropriation. The appropriation primarily supports the development of the nation's future military hardware and software and the technology base upon which those products rely.

Nearly all of what DOD spends on RDT&E is appropriated in Title IV of the defense appropriation bill. (See **Table 5**.) However, RDT&E funds are also appropriated in other parts of the bill. For example, RDT&E funds are appropriated as part of the Defense Health Program and the Chemical Agents and Munitions Destruction Program. The Defense Health Program supports the delivery of health care to DOD personnel and their families. Program funds are requested through the Operations and Maintenance appropriation. The program's RDT&E funds support congressionally directed research in such areas as breast, prostate, and ovarian cancer and other medical conditions. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program have been requested through the Procurement appropriation. The Joint Improvised Explosive Device Defeat Fund (JIEDDF) also contains RDT&E monies. However, the fund does not contain an RDT&E line item as do the two programs mentioned above. The Joint Improvised Explosive Device Defeat Office, which now administers the fund, tracks (but does not report) the amount of funding allocated to RDT&E. The JIEDDF funding is not included in the table below. Typically, Congress has funded each of these programs in Title VI (Other Department of Defense Programs) of the defense appropriations bill.

RDT&E funds also have been requested and appropriated as part of DOD's separate funding to support efforts in what the Bush Administration had termed the Global War on Terror (GWOT), and what the Obama Administration refers to as Overseas Contingency Operations (OCO). Typically, the RDT&E funds appropriated for GWOT/OCO activities go to specified Program Elements (PEs) in Title IV. However, they are requested and accounted for separately. The Bush Administration requested these funds in separate GWOT emergency supplemental requests. The Obama Administration, while continuing to identify these funds uniquely as OCO requests, has included these funds as part of the regular budget, not in emergency supplementals. However, the Obama Administration will ask for additional OCO funds in supplemental requests, if the initial OCO funding is not enough to get through the fiscal year.

In addition, GWOT/OCO-related requests/appropriations often include money for a number of transfer funds. These include the Iraqi Freedom Fund (IFF), the Iraqi Security Forces Fund, the Afghanistan Security Forces Fund, the Mine Resistant and Ambush Protected Vehicle Fund

[19] Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010. The USGCRP figures do not include Climate Change International Assistance programs in the U.S. Agency for International Development (U.S. AID), $43 million requested for FY2011. For additional information on the USGCRP, see CRS Report RL33817, *Climate Change: Federal Program Funding and Tax Incentives*, by Jane A. Leggett.

[20] This section was written by John Moteff, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

(MRAPVF), and, beginning in FY2010, the Pakistan Counterinsurgency Capability Fund. Congress typically makes a single appropriation into each of these funds, and authorizes the Secretary to make transfers to other accounts, including RDT&E, at his discretion.

For FY2011, the Obama Administration requested $76.131 billion for DOD's baseline Title IV RDT&E, roughly $4.5 billion (between 5% and 6%) less than the funding available for baseline Title IV RDT&E in FY2010. The FY2011 requests for RDT&E in the Defense Health Program and the Chemical Agents and Munitions Destruction program were $500 million and $401 million, respectively. In addition, the Obama Administration requested $635 million in FY2011 OCO-related RDT&E. It also intends to submit a supplemental request for additional FY2010 OCO funding, which will include $277 million for RDT&E.

RDT&E funding can be broken out in a couple of ways. Each of the military departments request and receive their own RDT&E funding. So, too, do various DOD agencies (e.g., the Missile Defense Agency and the Defense Advanced Research Projects Agency), collectively aggregated within the Defensewide account. RDT&E funding also can be characterized by budget activity (i.e., the type of RDT&E supported). Those budget activities designated as 6.1, 6.2, and 6.3 (basic research, applied research, and advanced technology development, respectively) constitute what is called DOD's Science and Technology Program (S&T) and represent the more research-oriented part of the RDT&E program. Budget activities 6.4 and 6.5 focus on the development of specific weapon systems or components (e.g., the Joint Strike Fighter or missile defense systems), for which an operational need has been determined and an acquisition program established. Budget activity 6.7 supports system improvements in existing operational systems. Budget activity 6.6 provides management support, including support for test and evaluation facilities.

Congress is particularly interested in S&T funding since these funds support the development of new technologies and the underlying science. Ensuring adequate support for S&T activities is seen by some in the defense community as imperative to maintaining U.S. military superiority. This was of particular concern at a time when defense budgets and RDT&E funding were falling at the end of the Cold War. As part of its 2001 Quadrennial Review, DOD established a goal of stabilizing its baseline S&T funding (i.e., Title IV) at 3% of DOD's overall funding. Congress has embraced this goal.

The FY2011 baseline S&T funding request in Title IV is $11.819 billion, about $1.928 billion (14%) less than the funding available for baseline S&T in Title IV in FY2010. Furthermore, the S&T request for baseline Title IV is approximately 2.2% of the overall baseline DOD budget request ($549 billion, not counting funds for the Overseas Contingency Operations), short of the 3% goal.

Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities. DOD is not a large supporter of basic research, when compared to NIH or NSF. However, over half of DOD's basic research budget is spent at universities and represents the major contribution of funds in some areas of science and technology (such as electrical engineering and material science). The FY2011 request for basic research ($1.999 billion) is roughly $166 million (8%) less than what was available for Title IV basic research in FY2010.

While the FY2011 request for RDT&E is below the funding provided in FY2010, Congress provided more funding than requested in FY2010, as it has for a number of years. Even so, the FY2011 request is roughly $2.5 billion below the Administration's FY2010 request. The Administration requested more in FY2011 than FY2010 for basic research and applied research.

Table 5. Department of Defense RDT&E

(in millions of dollars)

	FY2009	FY2010	FY2010	FY2011 Request	
Budget Account	**Base + OCO Actual[a]**	**Base + OCO Enacted**	**Supplemental Request**	**Base**	**OCO**
Army	12,079	11,472	62	10,333	151
Navy	19,734	19,967	5	17,693	60
Air Force	26,692	28,273[b]	188	27,247	266
Defensewide	21,661	20,737	22	20,662	157
Dir. Test & Eval.	185	188		195	
Total Title IV - By Account[c]	**80,351**	**80,639**	**277**	**76,131**	**635**
Budget Activity					
6.1 Basic Research	1,756	2,165		1,999	
6.2 Applied Research	4,989	5,038		4,476	
6.3 Advanced Dev.	6,320	6,544		5,344	14
6.4 Advanced Component Dev. and Prototypes	14,859	14,485		13,877	75
6.5 Systems Dev. and Demo	18,125	17,299	66	16,453	44
6.6 Management Support[d]	5,983	4,745	11	4,484	5
6.7 Op. Systems Dev. [e]	28,320	30,362	200	29,498	497
Classified programs	*17,665*	*17,724*	*200*	*17,590*	*356*
Total Title IV - by Budget Activity[c]	**80,351**	**80,639**	**277**	**76,131**	**635**
Title VI - Other Defense Programs					
Defense Health Program	1,095	1,288		500	
Chemical Agents and Munitions Destruction	289	401		401	
Grand Total	**81,735**	**82,036**	**277**	**77,032**	**635**

Source: CRS, adapted from the Department of Defense Budget, Fiscal Year 2011, RDT&E Programs (R-1), February 2010. The Defense Health Program figures taken from the Defense of Defense Budget, FY2011, Military Personnel Programs(M-1), Operation and Maintenance Programs (O-1), Revolving and Management Funds (RF-1), February 2010. Chemical Agents and Munitions Destruction Program figures taken from the Defense Department Budget, FY2011, Procurement (P-1), February 2010.

a. FY2009 figures do not include $300 million for Title IV RDT&E provided in the American Recovery and Reinvestment Act (P.L. 111-5).

b. Includes $292 million for Tanker Replacement Transfer Fund.

c. Total Budget Authority for Account and Budget Activity may not agree due to rounding.

d. Includes funds for Developmental and Operational Test and Evaluation.

e. Includes funding for classified programs. Funding for classified programs in parentheses.

Department of Homeland Security[21]

The Department of Homeland Security (DHS) has requested $1.344 billion for R&D and related programs in FY2011, a 4% decrease from FY2010.[22] This total includes $1.018 billion for the Directorate of Science and Technology (S&T), $306 million for the Domestic Nuclear Detection Office (DNDO), and $20 million for Research, Development, Test, and Evaluation (RDT&E) in the U.S. Coast Guard. (See **Table 6**.)

The S&T Directorate is the primary DHS R&D organization.[23] Headed by the Under Secretary for Science and Technology, it performs R&D in several laboratories of its own and funds R&D performed by the DOE national laboratories, industry, universities, and others. The Administration has requested a total of $1.018 billion for the S&T Directorate for FY2011. This is 2% more than the FY2010 appropriation, but it includes $109 million for radiological and nuclear countermeasures R&D, an activity formerly funded in DNDO. Funding for the directorate's other activities would decline by 9%. The proposed reduction of $39 million for the Infrastructure and Geophysical Division would include the termination of local and regional initiatives previously established or funded at congressional direction. The request for Laboratory Facilities includes no funds for the planned National Bio and Agro-Defense Facility (NBAF), which received $32 million in FY2010, but DHS plans to request a reprogramming of unobligated prior-year funds to support construction of a utility plant at the NBAF site.[24]

The construction of NBAF will likely require significant increases in Laboratory Facilities funding over the next several years. It may also result in increased congressional oversight. For construction of NBAF and decommissioning of the Plum Island Animal Disease Center (PIADC), which NBAF is intended to replace, DHS expects to need further appropriations of $691 million between FY2012 and FY2017. The estimated total federal cost of the NBAF project increased from $451 million in December 2006 to $615 million in May 2009. Additional site-specific infrastructure and utility upgrade costs of $110 million are to be contributed in-kind by Kansas State University and its partners. Decommissioning PIADC is expected to cost another $190 million. These estimated costs have not changed since May 2009, but the completion schedule has been extended by one year because the process of selling Plum Island is taking longer than DHS had planned. In the Department of Homeland Security Appropriations Act, 2009 (P.L. 110-329, Div. D, §540) and the Department of Homeland Security Appropriations Act, 2010 (P.L. 111-83, §540), Congress authorized DHS to use receipts from the sale of Plum Island, subject to appropriation, to offset NBAF construction and PIADC decommissioning costs.[25]

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[21] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[22] If the DNDO Systems Acquisition account, which funds little or no R&D, is excluded, then the FY2011 request is $1.283 billion, a decrease of 7% from FY2010.

[23] For more information, see CRS Report RL34356, *The DHS Directorate of Science and Technology: Key Issues for Congress*, by Dana A. Shea and Daniel Morgan.

[24] DHS is prohibited from obligating funds for NBAF construction until 90 days after it completes a safety and security assessment, has it evaluated by the National Academy of Sciences, and provides the Academy's report and certain other reports to the House and Senate appropriations committees. (Department of Homeland Security Appropriations Act, 2010, P.L. 111-83, §560) According to the DHS congressional budget justification for FY2011, DHS expects to conduct site preparation at the NBAF site during FY2010 and FY2011, and to begin construction of a utility plant in FY2011, but does not plan to commence construction of the laboratory facility until FY2012.

[25] For more information on NBAF, see CRS Report RL34160, *The National Bio- and Agro-Defense Facility: Issues for* (continued...)

Congress has been interested for several years in DHS policies and procedures for testing and evaluation (T&E) of large acquisition projects. This interest has especially focused on the T&E role of the S&T Directorate in acquisitions by other DHS components. The Homeland Security Act of 2002 (P.L. 107-296, §306) authorizes the Secretary of Homeland Security, acting through the Under Secretary for Science and Technology, to "issue necessary regulations with respect to ... testing and evaluation activities of the Department." Under current DHS policy, in establishing T&E policies and procedures for DHS acquisitions, the Under Secretary acts through the Director of the S&T Directorate's Test and Evaluation and Standards Division (TSD) and a special assistant in the TSD known as the Director of Operational Testing and Evaluation (DOT&E).[26] Congressional oversight of DHS acquisition and T&E may therefore focus attention on the S&T Directorate's funding for Test and Evaluation and Standards.

Statutory authority for the Homeland Security Institute (HSI) expired in April 2009. Under its general authority to establish federally funded R&D centers, the S&T Directorate has replaced HSI with the Homeland Security Studies and Analysis Institute (HSSAI). It has also established a new Homeland Security Systems Engineering and Development Institute (HSSEDI). Both institutes are funded mostly on a cost-reimbursement basis by other S&T programs and other DHS and non-DHS agencies. The institutes attracted outside users in FY2009 at only about one-third the level that DHS had anticipated. Nevertheless, DHS expects them to grow rapidly in FY2010 and continue growing in FY2011. The FY2011 budget justification projects reimbursable obligations of $187 million in FY2011, more than four times the FY2009 level of $42 million.

The Domestic Nuclear Detection Office (DNDO) is the primary DHS organization for combating the threat of nuclear attack. It is responsible for all DHS nuclear detection development, testing, evaluation, acquisition, and operational support. Under the Administration's FY2011 budget, DNDO's research role would be transferred to the S&T Directorate. The Administration has requested a total of $306 million for DNDO for FY2011. This is a 20% decrease from the FY2010 appropriation, but if the Transformational R&D program, which would be transferred to the S&T Directorate, is excluded, the remaining activities would increase by 12%. In some cases, however, there would be substantial shifts in emphasis. Systems Acquisition would receive $53 million for human-portable radiation detection systems, versus none in FY2010. Systems Development would be reduced by $31 million.

Congressional attention has focused in recent years on the testing and analysis DNDO has conducted to support its planned purchase and deployment of Advanced Spectroscopic Portals (ASPs), a type of next-generation radiation portal monitor.[27] Congress has included a requirement for secretarial certification before full-scale ASP procurement in each homeland security appropriations act from FY2007 through FY2010. The expected date for certification has been postponed several times. In February 2010, DHS decided that it would no longer pursue the use of ASPs for primary screening, although it will continue developing and testing them for use in secondary screening.[28]

(...continued)

Congress, by Dana A. Shea, Jim Monke, and Frank Gottron.

[26] DHS, *Acquisition Management Directive*, DHS Directive 102-01, revision 01, authorized by the Under Secretary for Management on January 20, 2010.

[27] For more information, see CRS Report RL34750, *The Advanced Spectroscopic Portal Program: Background and Issues for Congress*, by Dana A. Shea, John D. Moteff, and Daniel Morgan.

[28] Letter from Dr. William K. Hagan, Acting Director, DNDO, to Senator Lieberman, February 24, 2010, (continued...)

The global nuclear detection architecture overseen by DNDO remains an issue of congressional interest.[29] According to the FY2011 budget justification, the proposed reduction in funding for Systems Development reflects "a shift in DNDO priorities to developing a wider range of potential solutions to enduring vulnerabilities in the global nuclear detection architecture" and will result in increased funding for "systems studies, as well as testing and piloting existing technologies in new operational environments." Congress may wish to consider the basis for and implications of these changes in priorities, including how they may affect other elements of the global architecture. Other agencies with a role in the architecture, in addition to DHS, include the DOD, DOE, Department of State, and the intelligence community.

The mission of DNDO, as established by Congress in the SAFE Port Act (P.L. 109-347, Title V), includes serving as the primary federal entity "to further develop, acquire, and support the deployment of an enhanced domestic system" for detection of nuclear and radiological devices and material (6 U.S.C. 592). The act also eliminated any explicit mention of radiological and nuclear countermeasures from the statutory duties and responsibilities of the Under Secretary for S&T. Congress may consider whether the proposed transfer of DNDO's research activities to the S&T Directorate is consistent with its intent in the SAFE Port Act. Congress may also choose to consider the acquisition portion of DNDO's mission. Most of DNDO's funding for Systems Acquisition was eliminated in FY2010, and that year's budget stated that "funding requests for radiation detection equipment will now be sought by the end users that will operate them."[30] In contrast, the FY2011 request for Systems Acquisition includes more funding than ever before for DNDO's procurement of human-portable radiation detectors on behalf of the Coast Guard, Customs and Border Protection, and the Transportation Security Administration. The reasons for this apparent reversal of policy are not explained in the FY2011 budget justification for DNDO.

Table 6. Department of Homeland Security R&D and Related Programs

(in millions of dollars)

	FY2009 Actual	FY2010 Enacted	FY2011 Request
Directorate of Science and Technology	**$933**	**$1,000**	**$1,018**
Management and Administration	132	143	152
R&D, Acquisition, and Operations	800	856	866
Border and Maritime	*33*	*44*	*40*
Chemical and Biological	*200*	*207*	*201*
Command, Control, and Interoperability	*75*	*82*	*75*
Explosives	*96*	*121*	*121*
Human Factors / Behavioral Sciences	*12*	*16*	*13*
Infrastructure and Geophysical	*76*	*75*	*36*

(...continued)

http://hsgac.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=11f7d1f0-c4fe-4105-94e6-bb4a0213f048.

[29] For more information, see CRS Report RL34574, *The Global Nuclear Detection Architecture: Issues for Congress*, by Dana A. Shea.

[30] Executive Office of the President, FY2010 Budget, Appendix, p. 560.

	FY2009 Actual	FY2010 Enacted	FY2011 Request
Radiological and Nuclear	*—*	*—*	*109*
Innovation	*33*	*44*	*44*
Laboratory Facilities	*162*	*150*	*122*
Test and Evaluation, Standards	*29*	*29*	*23*
Transition	*29*	*46*	*42*
University Programs	*50*	*49*	*40*
Homeland Security Institute	*5*	*—*	*—*
Rescission of Prior-Year Unobligated Balances	*—*	*(7)*	*—*
Domestic Nuclear Detection Office	**514**	**383**	**306**
Management and Administration	38	38	37
Research, Development, and Operations	323	325	208
Systems Engineering and Architecture	*25*	*25*	*39*
Systems Development	*108*	*100*	*69*
Transformational R&D	*103*	*109*	*—*
Assessments	*32*	*32*	*43*
Operations	*38*	*38*	*34*
Forensics	*17*	*20*	*23*
Systems Acquisition	153	20	61
Radiation Portal Monitors Program	*120*	*—*	*8*
Securing the Cities	*20*	*20*	*—*
Human Portable Radiation Detection Systems	*13*	*—*	*53*
U.S. Coast Guard RDT&E	**18**	**25**	**20**
TOTAL	**1,465**	**1,407**	**1,344**

Source: DHS FY2011 budget justification, online at http://www.dhs.gov/xabout/budget/.

Notes: Totals may not add because of rounding.

National Institutes of Health[31]

President Obama's FY2011 budget request includes an NIH program level total of $31.947 billion, a $1 billion (3.2%) increase over the FY2010 level of $30.947 billion, which was provided in Division D of the Consolidated Appropriations Act, 2010 (P.L. 111-117). The FY2010 amount was a $693 million (2.3%) increase over the FY2009 level of $30.254 billion. (See **Table 7**.) In addition to the FY2009 regular appropriations, which were provided in Division F of the Omnibus Appropriations Act, 2009 (P.L. 111-8), NIH received emergency supplemental appropriations in Division A of the ARRA (P.L. 111-5). ARRA provided a total of $10.400 billion

[31] This section was written by Pamela Smith, Analyst in Biomedical Policy, CRS Domestic Social Policy Division.

to NIH, of which $4.954 billion was obligated in FY2009, leaving $5.446 billion available for obligation in FY2010.

Funding for NIH comes primarily from the annual appropriations bill for the Departments of Labor, Health and Human Services, and Education, and Related Agencies (Labor/HHS), with an additional amount for Superfund-related activities from the appropriations bill for the Department of the Interior, Environment, and Related Agencies (Interior/Environment). Those two bills provide NIH's discretionary budget authority. In addition, NIH receives mandatory funding of $150 million annually that is provided in the Public Health Service (PHS) Act for a special program on diabetes research, and also receives $8.2 million annually for the National Library of Medicine from a transfer within PHS. Each year since FY2002, Congress has provided that a portion of NIH's Labor/HHS appropriation be transferred to the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria. The transfer, currently $300 million, is part of the U.S. contribution to the Global Fund. The total funding available for NIH activities, taking account of add-ons and transfers, is the program level. Because the "NIH program level" cited in the Administration's FY2011 budget documents does not reflect the Global Fund transfer, **Table 7** shows the program level both before and after the transfer. Discussions in this section refer to the program level after the transfer.

In FY2003, NIH reached the peak of its purchasing power from regular appropriations when Congress completed a five-year doubling of the NIH budget. In each year since then, NIH's buying power has declined because its annual appropriations have grown at a lower rate than the inflation rate for medical research. Congress provided NIH with annual increases in the range of 14% to 15% each year from FY1999 through FY2003. From FY2004 to FY2009, increases dropped to between 1.0% and 3.2% each year (except that the FY2006 total was a 0.3% decrease), at a time when, according to NIH, the biomedical research inflation rate ranged between 3.4% and 4.7% per year. The projected changes in the Biomedical Research and Development Price Index (BRDPI) are 3.1% for FY2010 and 3.2% for FY2011.[32] Even though in current dollars, the FY2010 NIH total is 14.3% higher than it was in FY2003, in inflation-adjusted terms (converting all amounts to constant 2010 dollars), the FY2010 funding level represents an estimated 12.6% decrease in purchasing power from the FY2003 peak. Similarly, the FY2011 budget request proposes growth of 3.2%, equal to the projected inflation rate; in constant dollars, the NIH total would remain 12.5% below the FY2003 level.

The agency's organization consists of the Office of the NIH Director and 27 institutes and centers. The Office of the Director (OD) sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The institutes and centers (collectively called ICs) focus on particular diseases, areas of human health and development, or aspects of research support. Each IC plans and manages its own research programs in coordination with the Office of the Director. As shown in **Table 7**, Congress provides a separate appropriation to 24 of the 27 ICs, to OD, and to a Buildings and Facilities account. (The other three centers, not included in the table, are funded through the NIH Management Fund.)

[32] National Institutes of Health, *Biomedical Research and Development Price Index (BRDPI): Fiscal Year 2009 Update and Projections for FY 2010-FY 2015*, Bethesda, MD, February 1, 2010, http://officeofbudget.od.nih.gov/pdfs/FY11/BRDPI_Proj_Feb_2010.pdf.

The $1 billion increase proposed in the FY2011 budget request would be shared across all of the ICs, with most of them receiving increases of 2.5% to 3.6%. NIH has identified five broad areas of "exceptional scientific opportunity" in which it plans to target resources to advance basic and clinical research. Specific programmatic increases, many of them trans-NIH efforts, are described below within the five major research areas.

Genomics and Other High Throughput Technologies. Technologies such as DNA sequencing, microarrays, small molecule screening, new imaging methods, and computational biology have enabled basic science research on a much more comprehensive scale than in the past. NIH plans to continue work on The Cancer Genome Atlas, cataloging the characteristics of 20 common malignancies, and will undertake complete genome sequencing and analysis of 300 autism spectrum disorder cases. In support of the National Nanotechnology Initiative, NIH is requesting an increase of $22 million (6.0%) to a total of $382 million for its nanotechnology research portfolio.

Translational Medicine. NIH continues to emphasize the movement of basic science discoveries into development of improved treatments. The request includes doubling support of a trans-NIH initiative launched in FY2009, the Therapeutics for Rare and Neglected Diseases (TRND) program, from $24 million to $50 million. The program focuses on the pre-clinical stage of drug development in partnership with the private sector. The Clinical and Translational Science Awards (CTSA) program would increase to a total of $500 million in support of a consortium of 60 academic health centers doing collaborative research and training. Cancer researchers plan the initiation of 30 new drug trials in FY2011 and a doubling of the number of novel compounds in Phase 1-3 clinical trials by 2016. NIH's HIV/AIDS research portfolio, covering the spectrum from basic viral research to vaccine development trials, would increase 3.2% to about $3.2 billion in FY2011. Overall funding on stem cell research would increase by $30 million to $1.1 billion.

Science to Enable Health Reform. In recent years, NIH has expanded its support of projects in fields that could improve the quality and cost-effectiveness of treatments. Examples include comparative effectiveness research, health disparities research, the identification of prevention approaches and opportunities for more personalized medicine, pharmacogenomics, health economics research, and social and behavioral research. A trans-NIH initiative called the Basic Behavioral and Social Sciences Opportunity Network (OppNet) was started in FY2010 with ARRA funds. It aims to enhance the understanding of fundamental mechanisms of behavioral and social functioning to develop new approaches for reducing risky behaviors and improving health. The FY2011 request proposes a $20 million investment in OppNet, shared 50/50 between the Office of the Director and support from all the ICs.

Global Health. In addition to providing the transfer for the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria, discussed above, NIH has long supported extensive research on these "big three" worldwide health threats. As part of the Obama Administration's Global Health Initiative, the FY2011 budget proposes increased emphasis on researching prevention, diagnostics, and therapeutics for other neglected diseases of the developing world. NIH often does this work in partnership with other funding organizations such as the Bill and Melinda Gates Foundation. The Fogarty International Center's budget is proposed for a 4.3% increase from $70 million to $73 million; no specific funding amounts are detailed for overall NIH work on global health.

Reinvigorating the Biomedical Research Community. In addition to specific increases in support of research grants and contracts (discussed below), the FY2011 budget requests a 6.0% increase in stipends for predoctoral and postdoctoral trainees supported by the Ruth L. Kirschstein National Research Service Awards program. The increase, which would raise the funding for the program by $42 million to $824 million, is part of the Administration's emphasis on supporting science, technology, engineering, and mathematics (STEM) education programs. On the research resources side, a promising research tool called the National Synchrotron Light Source-II, currently under construction by the DOE, will receive a second contribution of support from NIH. The National Center for Research Resources contributed $12 million in FY2010 from ARRA funds, and NIH has made a commitment to DOE for an additional $33 million in FY2011, for a total of $45 million. The high-performance light source is expected to become operational around 2015.

Research Project Grants. Of the funds appropriated to NIH each year, about 84% go out to the extramural research community in the form of grants, contracts, and other awards. The funding supports research performed by more than 300,000 scientists and technical personnel who work at more than 3,100 universities, hospitals, medical schools, and other research institutions around the country and abroad. The primary funding mechanism for support of the full range of investigator-initiated research is competitive, peer-reviewed research project grants (RPGs). In the FY2011 request, total funding for RPGs, at $17.1 billion, represents about 53% of NIH's budget. The request proposes to support an estimated 37,001 awards, 195 RPGs more than are projected to be supported in FY2010, excluding ARRA funds. Within that total, 9,052 competing RPG awards are expected to receive support, 199 fewer than in FY2010. ("Competing" awards means new grants plus competing renewals of existing grants.) The request provides inflation-adjustment increases of 2.0% for noncompeting continuation awards, as well as a 2.0% increase in the average cost of competing RPGs (raising that cost to about $443,000 per award).

Under the request, the overall "success rate" of RPG applications receiving funding is expected to fall to about 15%, considerably below the 21% estimated rate for FY2010. Estimated success rates for the various ICs are expected to range from 7% to 27%, compared to anticipated rates of 11% to 31% for FY2010, including ARRA applications and funded grants. NIH expects the lower FY2011 success rates in part because it anticipates receiving a high volume of applications resulting from the resubmission of unfunded ARRA applications from FY2009 and FY2010. In addition, many researchers who did receive ARRA support will probably wish to compete for continued funding in FY2011. A further factor squeezing available funds for RPGs, however, is that biomedical research has been moving towards more interdisciplinary, team-based work, so the balance between investigator-initiated projects and larger-scale community resource programs is likely to shift away slightly from individual RPGs to other funding mechanisms such as research centers and R&D contracts.

Several NIH efforts are focused on supporting new investigators to encourage young scientists to undertake careers in research and to help them speed their transition from training to independent research. The Pathway to Independence program provides, through all the ICs, mentored grants that convert to independent RPGs. The NIH Director's New Innovator Award program provides first-time independent awards to especially creative investigators; the Administration plans to spend $80 million to support New Innovator Awards through the Common Fund in FY2011. In FY2009, NIH began giving special consideration during peer review to applications for research support made by Early Stage Investigators (new investigators who are within 10 years of having completed their terminal (i.e., final) research degree or residency). The traditional peer-review system, though widely lauded, is also increasingly criticized for its tendency towards

conservatism and potential for not allowing full exploration of innovative, high-risk/high reward proposals. NIH has been pursuing steps to enhance peer review since 2008.[33]

Other Funding Mechanisms. Changes proposed in the request for other funding mechanisms within the NIH budget include increased support for research centers, up $56 million (1.9%) to $3.090 billion, including support of the Clinical and Translational Science Awards. Support for grants in the Other Research category is proposed to increase by $47 million (2.6%) to a total of $1.854 billion. The stipend increase for the Research Training program was discussed above; the requested level for training would support 17,164 Full-Time Training Positions, 92 (0.5%) fewer than in FY2010. R&D contracts would increase by $86 million (2.5%) to $3.546 billion, including $300 million for the Global HIV/AIDS Fund. The NIH intramural research program, representing about 10% of the NIH budget, is proposed to increase by $109 million (3.2%) to a total of $3.394 billion. The request includes a proposed increase of $73 million (5.0%) to a total of $1.525 billion for research management and support. As has been the case for the past five years, no new funding is requested for extramural research facilities construction and renovation. The ARRA provided $1.0 billion for this purpose, most of which remains to be obligated in FY2010. Funding for repairs and construction to intramural buildings and facilities would increase by $25 million (23.6%) to $133 million, returning it to the FY2009 level. FY2010 funding was reduced to $108 million because of the availability of $500 million from ARRA.

The appropriation for the Office of the Director (OD) covers a variety of cross-cutting programs in addition to funding for OD's own leadership and management operations. The request proposes aggregate funding for OD of $1.220 billion for FY2011, an increase of $43 million (3.7%) over FY2010. As in FY2010, funding for the NIH Director's Bridge Award program is not included, since ARRA funds enabled NIH to support additional awards to investigators whose renewal applications had just missed the funding cutoff. The other programs managed or coordinated by OD are all proposed for sustained or increased funding. OD Operations would increase from $151 million in FY2010 to $158 million (4.9%). The President requested funding of $194 million for continuation of the National Children's Study, a 0.3% increase. The request includes $100 million (up $3 million) for research on medical countermeasures against nuclear, radiological, and chemical threats. A total of $196 million (up $15 million and 8.3%) is requested for several program coordination offices that work with the ICs, including $10 million in the Office of Behavioral and Social Sciences Research for OD's contribution to the OppNet initiative described earlier.

Also funded through the OD account is the NIH Common Fund, which supports NIH Roadmap initiatives and other trans-institute research. The NIH Roadmap for Medical Research is a set of trans-NIH research activities designed to support high-risk/high-impact research in emerging areas of science or public health priorities. For FY2011, the President requests $562 million for the Roadmap/Common Fund, up $18 million (3.2%) from FY2010. Some Roadmap programs that have been supported for five years are ready to transition to the ICs for continued support. The Common Fund is also supporting a number of initiatives with ARRA money. See further discussion below.

NIH and three of the other Public Health Service agencies within HHS are subject to a budget tap called the PHS Program Evaluation Set-Aside. Section 241 of the PHS Act (42 U.S.C. § 238j) authorizes the Secretary to use a portion of eligible appropriations to assess the effectiveness of

[33] See http://enhancing-peer-review.nih.gov/.

federal health programs and to identify ways to improve them. The set-aside has the effect of redistributing appropriated funds for specific purposes among PHS and other HHS agencies. Section 205 of the FY2010 Labor/HHS appropriations act capped the set-aside at 2.5%, instead of the 2.4% maximum that had been in place for several years. The FY2011 budget proposes to increase the set-aside to 2.9%. NIH, with the largest budget among the PHS agencies, becomes the largest "donor" of program evaluation funds, and is a relatively minor recipient. By convention, budget tables such as **Table 7** do not subtract the amount of the evaluation tap, or of other taps within HHS, from the agencies' appropriations.[34]

ARRA Funding. As mentioned earlier, NIH received a total of $10.400 billion in ARRA. The funding given to NIH included $8.2 billion for scientific research; $1.3 billion for non-federal research facility construction, renovation, and equipment; $500 million for NIH buildings and facilities; and $400 million for comparative effectiveness research.[35] The funds were made available for obligation for two years. FY2009 obligations totaled $4.954 billion, leaving $5.446 billion available in FY2010.

Activities supported with NIH's ARRA funding are being tracked on the NIH Recovery website.[36] On a webpage about current grant funding opportunities, NIH says: "While NIH Institutes and Centers have broad flexibility to invest in many types of grant programs, they will follow the spirit of the ARRA by funding projects that will stimulate the economy, create or retain jobs, and have the potential for making scientific progress in 2 years."[37] The agency's implementation plans for the various funding categories are available on the HHS Recovery Plans website.[38] NIH is focusing activities on (1) funding new and recently peer-reviewed, highly meritorious research grant applications that can be accomplished in two years or less; (2) giving targeted supplemental awards to current grants to push research forward; and (3) supporting a new initiative called the NIH Challenge Grants in Health and Science Research for research on specific topics that would benefit from significant two-year jumpstart funds (grants have budgets under $500,000 per year). NIH received about 20,000 applications in response to the Challenge Grant announcement. Another new program, called Research and Research Infrastructure "Grand Opportunities" (GO) grants, supports large-scale research projects (budgets over $500,000 per year) that work in areas of specific knowledge gaps, create new technologies, or develop new approaches to multi- and interdisciplinary research teams. On September 30, 2009, President Obama spoke about the nearly $5 billion that NIH had awarded in ARRA funding in FY2009, supporting over 12,000 grants to research institutions across all the states. A White House press release highlighted examples of research in cancer, heart disease, and autism, particularly over $1 billion in research applying the technology produced by the Human Genome Project.[39]

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[34] For further information on the Evaluation Set-Aside, see CRS Report RL34098, *Public Health Service (PHS) Agencies: Background and Funding*, coordinated by Pamela W. Smith.

[35] For further details, see CRS Report R40181, *Selected Health Funding in the American Recovery and Reinvestment Act of 2009*, coordinated by C. Stephen Redhead.

[36] *NIH and the ARRA*, http://www.nih.gov/recovery/.

[37] *Grant Funding Opportunities Supported by the American Recovery & Reinvestment Act of 2009 (ARRA)*, http://grants.nih.gov/recovery/. The site also includes searchable state-by-state data on ARRA-funded awards.

[38] Department of Health and Human Services, *Department of Health and Human Services Agency-Wide Plan*, http://www.hhs.gov/recovery/reports/plans/index.html. See the section on "Strengthening Scientific Research and Facilities."

[39] See the press release, "President Obama Announces Recovery Act Funding for Groundbreaking Medical Research," and an accompanying fact sheet, at http://www.whitehouse.gov/the_press_office/President-Obama-Announces-Recovery-Act-Funding-For-GroundingBreaking-Medical-Research/ and http://www.whitehouse.gov/the_press_office/ (continued...)

Table 7. National Institutes of Health

(in millions of dollars)

Institutes and Centers (ICs)	FY2009 Comparable[a]	FY2009 ARRA[b]	FY2010 Comparable[c]	FY2011 Request
Cancer (NCI)	4,968	1,257	5,102	5,265
Heart, Lung, and Blood (NHLBI)	3,015	763	3,096	3,188
Dental and Craniofacial Research (NIDCR)	403	102	413	424
Diabetes, Digestive, and Kidney Diseases (NIDDK)	1,760	445	1,807	1,858
Neurological Disorders and Stroke (NINDS)	1,593	403	1,636	1,681
Allergy and Infectious Diseases (NIAID)[d]	4,701	1,113	4,817	4,977
General Medical Sciences (NIGMS)	1,997	505	2,051	2,125
Child Health and Human Development (NICHD)	1,295	327	1,329	1,369
Eye (NEI)	688	174	707	724
Environmental Health Sciences (NIEHS)	663	187	690	707
Aging (NIA)	1,080	273	1,110	1,142
Arthritis, Musculoskeletal, and Skin Diseases (NIAMS)	525	133	539	556
Deafness and Communication Disorders (NIDCD)	407	103	419	429
Nursing Research (NINR)	142	36	146	150
Alcohol Abuse and Alcoholism (NIAAA)	450	114	462	475
Drug Abuse (NIDA)	1,032	261	1,059	1,094
Mental Health (NIMH)[e]	1,451	367	1,490	1,540
Human Genome Research (NHGRI)	502	127	516	534
Biomedical Imaging and Bioengineering (NIBIB)	308	78	316	326
Research Resources (NCRR)	1,226	1,610	1,269	1,309
Complementary and Alternative Medicine (NCCAM)	125	32	129	132
Minority Health and Health Disparities (NCMHD)	206	52	212	219
Fogarty International Center (FIC)	69	17	70	73
National Library of Medicine (NLM)	339	84	351	365
Office of Director (OD)[f]	1,247	1,337	1,177	1,220
Common Fund (non-add)	*(541)*	*(137)*	*(544)*	*(562)*

(...continued)

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Institutes and Centers (ICs)	FY2009 Comparable[a]	FY2009 ARRA[b]	FY2010 Comparable[c]	FY2011 Request
Buildings & Facilities (B&F)	126	500	100	126
Subtotal, Labor/HHS Appropriation	**30,318**	**10,400**	**31,010**	**32,007**
Superfund (Interior appropriation to NIEHS)[g]	78	0	79	82
Total, NIH discretionary budget authority	**30,396**	**10,400**	**31,089**	**32,089**
Pre-appropriated Type 1 diabetes funds[h]	150	0	150	150
PHS Evaluation Tap funding[i]	8	0	8	8
NIH program level before Global Fund transfer (cited in HHS budget documents)	*30,554*	*10,400*	*31,247*	*32,247*
Global Fund transfer (AIDS/TB/Malaria)[d]	-300	0	-300	-300
Total, NIH program level after Global Fund transfer	**30,254**	**10,400**	**30,947**	**31,947**

Source: Adapted by CRS from National Institutes of Health, *FY2011 Justification of Estimates for Appropriations Committees*, Tabular Data, p. TD-1, http://officeofbudget.od.nih.gov/pdfs/FY11/Tabular%20Data.pdf. Details may not add to totals due to rounding.

a. FY2009 Comparable reflects real transfers of $1 million from HHS to NIMH and $625,000 from NIDDK to OD/Office of AIDS Research, as well as comparable adjustments for transfers of funds from ICs to NLM. Does not reflect transfers among ICs under the NIH Director's 1% transfer authority.

b. Funds are appropriated from the American Recovery and Reinvestment Act, 2009 (P.L. 111-5) and are available until September 30, 2010.

c. FY2010 Comparable reflects real transfer of $1 million from HHS to NIMH as well as comparable adjustments for transfers of funds from ICs to NLM.

d. NIAID totals include funds for transfer to the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria ($300 million in each of FY2009, FY2010, and FY2011).

e. NIMH totals for FY2009 and FY2010 each include $1.0 million transferred from Office of the Secretary to administer the Interagency Autism Coordinating Committee.

f. FY2009 ARRA amount for OD includes $400 million transferred from the Agency for Healthcare Quality Research for comparative effectiveness research.

g. Separate account in the Interior/Environment appropriations for NIEHS research activities related to Superfund.

h. Mandatory funds available to NIDDK for Type 1 diabetes research under PHS Act § 330B (provided through P.L. 110-173 and P.L. 110-275). Funds have been appropriated through FY2011.

i. Additional funds for NLM from PHS Evaluation Set-Aside (§ 241 of PHS Act).

Department of Energy[40]

The Administration has requested $12.797 billion for Department of Energy (DOE) R&D and related programs in FY2011, including activities in three major categories: science, national

[40] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

security, and energy. This request is 7.2% more than the FY2010 appropriation of $11.941 billion. (See **Table 8** for details.)

The request for the DOE Office of Science is $5.121 billion, an increase of 4.4% from the FY2010 appropriation of $4.904 billion. The Administration intends to double the combined R&D funding of the Office of Science and two other agencies over the decade from FY2006 to FY2016.[41] This policy continues a goal first established by the Bush Administration as part of its American Competitiveness Initiative. The 4.4% increase requested for FY2011, however, is less than the 7.2% annual growth rate required to achieve a doubling in ten years. The America COMPETES Act (P.L. 110-69) authorized $5.814 billion for the Office of Science in FY2010; the act does not include authorizations beyond FY2010.

Most of the research programs of the Office of Science would receive increases under the Administration's budget proposal. The largest increase would be for basic energy sciences. Among other changes, this program would allocate $34 million for a new energy innovation hub on materials for batteries and energy storage and $24 million for the existing hub on fuels from sunlight.[42] The Administration proposed to initiate eight energy innovation hubs in FY2010, but Congress funded only three. The aim of the hubs is "to address basic science and technology hindering the nation's secure and sustainable energy future" by assembling multidisciplinary teams of researchers "spanning science, engineering, and other disciplines, but focused on a single critical national need identified by the Department."[43] Office of Science funding for graduate fellowships would triple to $15 million. In fusion energy sciences, the U.S. contribution to International Thermonuclear Experimental Reactor (ITER) would drop from $135 million to $80 million because of delays in the construction schedule. The current estimate for ITER's total project cost is $1.45 billion to $2.2 billion, but this range "presumed a much more aggressive schedule than has evolved thus far."[44] A revised estimate of cost and schedule is being developed for review by the ITER Council in mid-2010.

The request for DOE national security R&D is $3.850 billion, a 10.6% increase from $3.481 billion in FY2010. Funding for experiments and analysis in support of advanced certification of nuclear weapons would increase $58 million. An increase of $125 million for the naval reactors program would accelerate the continuing design of reactors for the Ohio-class ballistic missile submarine, modernization of the land-based prototype reactor, and recapitalization of program infrastructure. Funding for nonproliferation and verification R&D would increase $34 million to support testing and evaluation of new technologies for treaty monitoring.

The request for DOE energy R&D is $3.825 billion, up 7.6% from $3.556 billion in FY2010. In the energy efficiency and renewable energy program, solar and wind energy would increase $98 million; energy efficiency would increase $37 million; hydrogen and fuel cell technologies would decrease $37 million; and the RE-ENERGYSE program for education and workforce development in energy science and engineering, for which Congress appropriated no funds in FY2010, would receive $50 million. Funding for nuclear energy would increase $37 million, and

[41] Executive Office of the President, Office of Science and Technology Policy, *The President's Plan for Science and Innovation: Doubling Funding for Key Science Agencies in the 2011 Budget*, February 1, 2010, http://www.whitehouse.gov/sites/default/files/doubling 11 final.pdf.

[42] The fuels from sunlight hub is currently funded by the DOE Office of Energy Efficiency and Renewable Energy.

[43] DOE FY2011 budget justification, vol. 4, p. 86.

[44] DOE FY2011 budget justification, vol. 4, p. 235.

the program would be restructured to focus more on long-term R&D rather than short-term demonstration projects. In fossil energy R&D, no funds would be provided for natural gas technologies or unconventional fossil energy technologies; DOE budget documents describe this proposal as "consistent with Administration policy to phase out fossil fuel subsidies."[45]

The Advanced Research Projects Agency–Energy (ARPA-E) would receive $300 million under the Administration request. This agency received no appropriation for FY2010. The bulk of its funding so far has been provided by the ARRA.[46] In recommending no funds for ARPA-E in FY2010, the House Committee on Appropriations explained that ARRA funds remained available and that "the decision not to provide any additional funding ... [did] not in any way suggest a lack of commitment to this program by the Committee."[47]

Table 8. Department of Energy R&D and Related Programs

($ in millions)

	FY2009 Regular	FY2009 ARRA	FY2010 Enacted	FY2011 Request
Science	4,807	1,633	4,904	5,121
Basic Energy Sciences	1,536	555	1,636	1,835
High Energy Physics	776	232	810	829
Biological and Environmental Research	585	166	604	627
Nuclear Physics	500	155	535	562
Fusion Energy Sciences	395	91	426	380
Advanced Scientific Computing Research	359	162	394	426
Other	656	272	499	462
National Security	**3,357**	**0**	**3,481**	**3,850**
Weapons Activities[a]	2,141	0	2,198	2,395
Naval Reactors	828	0	945	1,070
Nonproliferation and Verification R&D	356	0	317	352
Def. Envtal. Cleanup Technology Devel.	31	0	20	32
Energy	**3,394**	**5,616**	**3,556**	**3,825**
Energy Efficiency and Renewable Energy[b]	1,641	5,227	1,973	1,970
Fossil Energy R&D	863	0	672	587
Nuclear Energy	791	0	787	824
Electricity Delivery & Energy Reliability R&D	83	0	125	144
Advanced Research Projects Agency–Energy	15	389	0	300
Total	**11,558**	**7,249**	**11,941**	**12,797**

[45] DOE FY2011 budget justification, vol. 3, pp. 701 and 710.

[46] For more information on ARPA-E, see CRS Report RL34497, *Advanced Research Projects Agency - Energy (ARPA-E): Background, Status, and Selected Issues for Congress*, by Deborah D. Stine.

[47] H.Rept. 111-203, p. 120.

Source: DOE FY2011 budget justification, online at http://www.cfo.doe.gov/budget/11budget/.

Notes:

a. Including Stockpile Services R&D Support, Stockpile Services R&D Certification and Safety, Science, Engineering except Enhanced Surety and Enhanced Surveillance, Inertial Confinement Fusion, Advanced Simulation and Computing, Science Technology and Engineering Capability, and a prorated share of Readiness in Technical Base and Facilities. Additional R&D activities may take place in the subprograms of Directed Stockpile Work that are devoted to specific weapon systems, but these funds are not included in the table because detailed funding schedules for those subprograms are classified.

b. Excluding Weatherization and Intergovernmental Activities.

National Science Foundation[48]

The FY2011 request for the National Science Foundation (NSF) is $7.424 billion, an increase of $551.0 million (8.0%) over the FY2010 estimate of $6.873 billion. (See **Table 9**.) Under President Obama's National Innovation Strategy,[49] the Administration proposed doubling the federal investment in three basic research agencies (NSF, DOE Office of Science, and NIST) over a period of 10 years relative to the FY2006 level. The National Innovation Strategy proposes added support and focus on high-risk, high-return research, on multidisciplinary research, and on scientists and engineers at the beginning of their careers. The FY2011 request for NSF is intended to be an installment toward the doubling effort of the Administration and is structured to build on the scientific investments funded by the 2009 Omnibus Appropriations Act and the ARRA. NSF obligated approximately 80.0% ($2.4 billion) of its ARRA funding in FY2009, making 4,599 awards and supporting 6,762 investigators/co-investigators. Of those investigators receiving ARRA funds, approximately 35.0% had never before received NSF support.[50]

NSF identified several strategies in the FY2011 budget request, including expanding the scientific workforce and broadening participation from underrepresented groups and geographical regions; increasing three-fold the number of new Graduate Research Fellowships awarded annually; expanding and enhancing international partnerships and interagency collaborations; performing effectively with the highest standards of accountability; and maintaining a portfolio of basic, high-risk, and transformative research across all disciplines. The NSF Director has described transformative research as "a range of endeavors, which promise extraordinary outcomes; such as, revolutionizing entire disciplines, creating entirely new fields, or disrupting accepted theories and perspective."[51] Several reports have recommended that funds be allocated specifically for this type of research. NSF contends that in the global environment of science and engineering, support for transformative, high-risk, high-reward research is critical to U.S. competitiveness. The FY2011 strategies for NSF parallel some of the goals contained in the Administration's Strategy for American Innovation and are designed to promote research that will drive innovation; support

[48] This section was written by Christine M. Matthews, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[49] Executive Office of the President, Office of Science and Technology Policy and National Economic Council, *A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs*, September 2009, http://www.whitehouse.gov/assets/documents/Sept_20_Innovation_whitepaper_FINAL.pdf.

[50] National Science Foundation, *National Science Foundation: FY2011 Budget Request to Congress*, February 1, 2010; Arden L. Bement, Jr., *FY 2011 Budget Request Remarks*, National Science Foundation, February 1, 2010, http://www.nsf.gov/news/speeches/bement/10/alb100201_budget.jsp.

[51] Arden L. Bement, Jr., *Transformative Research: The Artistry and Alchemy of the 21st Century*, National Science Foundation, January 4, 2007, http://www.nsf.gov/news/speeches/bement/07/alb070104_texas.jsp.

the design and development of world-class facilities, instrumentation, and infrastructure; and maintain an internationally competitive workforce.

Included in the FY2011 request is $6.019 billion for Research and Related Activities (R&RA), an increase of $454.9 million (8.2%) above the FY2010 estimate of $5.564 billion. R&RA funds research projects, research facilities, and education and training activities. Some in the scientific and academic communities have voiced concerns about the imbalance between support for the life sciences and the physical sciences. Research can be multidisciplinary and transformational, and often discoveries in the physical sciences lead to advances in other disciplines. The America COMPETES Act (P.L. 110-69) authorized increased federal research support in the physical sciences, mathematics, and engineering. The FY2011 request provides $1.410 billion for the Mathematical and Physical Sciences (MPS) Directorate, a 4.3% increase over the FY2010 level. The MPS portfolio supports investments in fundamental research, facilities, and instruments, and provides approximately 50% of the federal funding for basic research in mathematics and physical sciences conducted by colleges and universities, ranging from approximately 60% in mathematics to 35% in physics. R&RA includes Integrative Activities (IA), a cross-disciplinary research and education program that is also a source of funding for the acquisition and development of research instrumentation at institutions. In FY2008, support for the Experimental Program to Stimulate Competitive Research (EPSCoR)—a university-oriented program with the goal of identifying, developing, and utilizing the academic science and technology resources in a state that will lead to increased R&D competitiveness—was transferred from the Education and Human Resources Directorate (EHR) to IA. The FY2011 EPSCoR request includes $296.0 million for IA. The IA also funds Partnerships for Innovation, disaster research teams, and the Science and Technology Policy Institute. NSF's FY2011 request for EPSCoR is $154.4 million. The FY2011 request supports a portfolio of three complementary strategies—research infrastructure ($111.9 million), co-funding ($41.0 million), and outreach ($1.5 million)—for the 27 EPSCoR jurisdictions. The NSF states that approximately 65% of the funding for EPSCoR is to be used for new research awards in FY2011. The remaining funding is to be used to support grants made in previous years.[52]

The NSF asserts that international research partnerships are critical to the nation in maintaining a competitive edge, addressing global issues, and capitalizing on global economic opportunities. For FY2011, the Administration requested $53.3 million for the Office of International Science and Engineering (OISE), an 11.4% increase over FY2010. The OISE manages NSF's offices in Beijing, Paris, and Tokyo that analyze and report on in-country and regional science and technology policies and developments. The OISE serves as a liaison with research institutes and foreign agencies, and facilitates coordination and implementation of NSF research and education efforts.

The Office of Polar Programs (OPP) is funded under the R&RA account. The OPP is the primary source of U.S. support for basic research in polar regions. The NSF also leads several international research partnerships in the Arctic and Antarctic. Research in the Arctic and Antarctic explores the various aspects of the global Earth system that affect the global environment and climate. The FY2011 request for polar research is $528.0 million, a 17.0% increase over the FY2010 estimate. Increases in OPP in FY2011 are for arctic and antarctic sciences—glacial and sea ice, terrestrial and marine ecosystems, the ocean and the atmosphere,

[52] For additional information, see CRS Report RL30930, *U.S. National Science Foundation: Experimental Program to Stimulate Competitive Research (EPSCoR)*, by Christine M. Matthews.

and biology of life in the cold and dark. Priorities of the OPP in FY2011 include support for national energy goals, support for transformative research, resupply improvements at the research stations, and management and oversight of the environmental, health, and safety aspects of research operations conducted in polar regions. From FY2006 through FY2008, NSF was responsible for funding the operational costs of the U.S. Coast Guard's (USCG) three icebreakers that support scientific research in the polar regions—Polar Sea, Polar Star, and Healy.[53] NSF was responsible for operating, maintaining, and staffing the vessels under a Memorandum of Agreement (MOA) between NSF and USCG. Beginning in FY2009, the MOA no longer covered the Polar Star. The FY2011 request provides $54.0 million for the operation and maintenance of the Polar Sea and Healy. This support includes significant funding for a triennial dry dock for each vessel.

NSF supports several interagency R&D priorities in its FY2011 request. It is a supporter in the National Nanotechnology Initiative (NNI), requesting $401.3 million for nanotechnology research. Funding would support research in emerging areas of nanoscale science and technology such as new drug delivery systems, advanced materials, and more powerful computer chips. This funding includes $33.0 million for research to explore potential environmental, health, and safety effects of nanotechnology, and $32.2 million for nanomanufacturing. NSF's other interagency priorities in its FY2011 request include funding for the U.S. Global Change Research Program ($369.9 million), Homeland Security activities ($405.4 million), and Networking and Information Technology R&D ($1.170 billion).

The NSF supports a variety of centers and center programs. The FY2011 request provides $66.0 million for Science and Technology Centers, $63.0 million for Materials Research Science and Engineering Centers, $67.5 million for Engineering Research Centers, $40.2 million for Nanoscale Science and Engineering Centers, $25.8 million for Science of Learning Centers, $28.0 million for Centers for Chemical Innovation, and $23.3 million for Centers for Analysis and Synthesis.

The FY2011 request for the Education and Human Resources (EHR) Directorate is $892.0 million, $19.2 million (2.2%) above the FY2010 estimate. The EHR portfolio is focused on, among other things, increasing the technological literacy of all citizens; preparing the next generation of science, engineering, and mathematics professionals; and closing the achievement gap of underrepresented groups in all scientific fields. Support at the various educational levels in the FY2011 request is as follows: research on learning in formal and informal settings (including precollege), $247.9 million; undergraduate education, $290.0 million; and graduate education, $185.3 million. Priorities at the precollege level include research and evaluation on education in science and engineering ($45.7 million), informal science education ($64.4 million), project and program evaluation ($19.0 million), and Discovery Research K-12[54] ($118.7 million). Discovery Research is structured to combine the strengths of three existing programs and encourage innovative thinking in K-12 science, technology, engineering, and mathematics education.

According to NSF, its undergraduate level program is intended to address the needs of the 21st century while transforming undergraduate science and mathematics education. Priorities at the undergraduate level include the Robert Noyce Scholarship Program ($55.0 million); Curriculum,

[53] For expanded discussion of the icebreakers see for example CRS Report RL34391, *Coast Guard Polar Icebreaker Modernization: Background, Issues, and Options for Congress*, by Ronald O'Rourke.

[54] "K-12" refers to kindergarten through grade 12.

Laboratory and Instructional Development ($61.0 million); Advanced Technological Education ($64.0 million); and the Math and Science Partnership program (MSP, $58.2 million). The MSP is an interagency program and the NSF coordinates its MSP activities with the Department of Education and state-funded MSP sites. At the graduate level, NSF's priorities are Integrative Graduate Education and Research Traineeship (IGERT) ($29.5 million),[55] Graduate Research Fellowships ($107.9 million), and the Graduate STEM Fellows in K-12 Education ($48.2 million).

An additional priority in the EHR is to support a new comprehensive program to increase the participation of undergraduates at Historically Black Colleges and Universities, Tribal colleges and universities, and Hispanic-serving institutions. The new program, Comprehensive Broadening Participation of Undergraduates in STEM, will build on and realign the existing NSF programs that are directed at strengthening and expanding the participation of underrepresented groups and diverse institutions in the scientific and engineering enterprise. The Comprehensive Broadening Participation of Undergraduates in STEM is proposed at $103.1 million in the FY2011 request.

The Major Research Equipment and Facilities Construction (MREFC) account is funded at $165.2 million in the FY2011 request, a 40.5% increase above the FY2010 estimate. The MREFC supports the acquisition and construction of major research facilities and equipment that extend the boundaries of science, engineering, and technology. According to NSF, it is the primary federal agency providing support for forefront instrumentation and facilities for the academic research and education communities. NSF gives highest priority to ongoing projects, and second highest priority to projects that have been approved by the National Science Board for new starts. To qualify for support, NSF required MREFC projects to have "the potential to shift the paradigm in scientific understanding and/or infrastructure technology."[56] In FY2011, NSF anticipates construction of the National Ecological Observatory Network (NEON) at a cost of $20.0 million. The NEON will compile data on the effects of climate changes, land use changes, invasive species on natural resources, and biodiversity. The data from NEON is intended to have local, regional, and national uses. In addition to the support of NEON, NSF will continue its support of four ongoing construction projects: Advanced Laser Interferometer Gravitational Wave Observatory ($23.6 million); Atacama Large Millimeter Array ($13.9 million); Advanced Technology Star Telescope ($17.0 million); and the Ocean Observatories Initiative ($90.7 million).

Table 9. National Science Foundation

(in millions of dollars)

	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request
Biological Sciences	$656.2	$260.0	$714.5	$767.8
Computer & Information Sci. & Eng.	574.5	235.0	618.8	684.5
Engineering	665.0	265.0	743.9	825.7
Geosciences	808.5	347.0	889.6	955.3

[55] NSF's FY2011 request includes and additional $32.3 million for IGERT in the R&RA account.

[56] National Science Foundation, *National Science Foundation: FY2011 Budget Request to Congress*, February 1, 2010.

	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request
Math and Physical Sciences	1,243.9	475.0	1,351.8	1,409.9
Social, Behavioral, & Economic Sciences	240.6	85.0	255.3	268.8
Office of Cyberinfrastructure	199.2	80.0	214.3	228.1
Office of International Sci. & Eng.	47.5	14.0	47.8	53.3
U.S. Polar Programs	473.6	171.9	451.2	528.0
Integrative Activities	241.6	129.9	275.0	295.9
U.S. Arctic Research Comm.	1.5	—	1.6	1.6
Subtotal Res. & Rel. Act	**5,152.4**	**2,062.6**	**5,563.9**[a]	**6,018.8**
Education & Human Resources	845.5	85.0	872.8	892.0
Major Research Equip. & Facil. Constr.	160.8	254.0	117.3	165.2
Agency Ops. & Award Mgmt.	294.1	—	300.0	329.2
National Science Board	4.0	—	4.5	4.8
Office of Inspector General	12.0	(0.02)	14.0	14.4
Total NSF[b]	**6,468.8**[b]	**2,401.7**	**6,872.5**	**7,424.4**

Source: National Science Foundation, *FY2011 Budget Request to Congress,* Arlington, VA, February 1, 2010. Summary Tables.

a. Funding for FY2010 excludes a one-time appropriation transfer of $54.0 million to the U.S. Coast Guard per P.L. 111-117.

b. The totals do not include carryovers or retirement accruals. Totals may not add due to rounding.

Department of Commerce

National Institute of Standards and Technology[57]

The National Institute of Standards and Technology (NIST) is a laboratory of the Department of Commerce with a mandate to increase the competitiveness of U.S. companies through appropriate support for industrial development of precompetitive, generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. NIST research also provides the measurement, calibration, and quality assurance techniques that underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety.

The Administration's FY2011 budget proposes $918.9 million in funding for NIST, a 7.3% increase over the FY2010 appropriation. Support for in-house research and development under the Scientific and Technical Research and Services (STRS) account (including the Baldrige National Quality Program) increases 13.5% to $584.5 million. The Manufacturing Extension Partnership (MEP) program is to receive $129.7 million, 4.0% more than in FY2010, while

[57] This section was written by Wendy H. Schacht, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

financing for the Technology Innovation Program (TIP) increases 14.3% over FY2010 funding to $79.9 million. The construction budget declines 15.1% to $124.8 million. (See **Table 10**.)

The Consolidated Appropriations Act, 2010 (P.L. 111-117) provided $856.6 million in funding for NIST, an increase of 4.6% over the FY2009 appropriation. The STRS account (including the Baldrige National Quality Program) increased 9.1% to $515.0 million. The Manufacturing Extension Partnership Program received $124.7 million, 13.4% more than FY2009, while financing for TIP increased 7.5% to $69.9 million. Construction support totaled $147.0 million, 14.5% below the previous fiscal year.

No final FY2009 appropriations legislation was enacted by the close of the 110th Congress. P.L. 110-329, the Consolidated Security, Disaster Assistance, and Continuing Appropriations Act, 2009, provided, in part, funding for NIST at FY2008 levels through March 6, 2009. In the 111th Congress, P.L. 111-8, the FY2009 Omnibus Appropriations Act, funded NIST at $819.0 million with the STRS account receiving a 7.2% increase to $472.0 million (including the Baldrige Quality Program). Support for MEP totaled $110.0 million, a 22.8% increase, and financing for TIP remained constant at $65.0 million. The $172.0 million for the construction budget reflected a 7.2% increase in funding.

The ARRA provided an extra $222.0 million for the STRS account to be used for "research, competitive grants, additional research fellowships and advanced research and measurement equipment and supplies," as noted in the Joint Explanatory Statement of the Committee on Conference. An additional $360.0 million was included for construction, of which $180.0 million "shall be for the competitive construction grant program for research science buildings." The law also directed the transfer of $20.0 million from the Health Information Technology initiative to NIST to "create and test standards related to health security and interoperability in conjunction with partners at the Department of Health and Human Services," according to the Joint Statement.

Continued support for NIST extramural programs—currently the Manufacturing Extension Partnership (MEP) and the Technology Investment Program (TIP)—directed toward increased private sector commercialization has been a major issue. Some Members of Congress have expressed skepticism over a "technology policy" based on providing federal funds to industry to develop pre-competitive generic technologies. This approach, coupled with pressures to balance the federal budget, led to significant reductions in appropriations for several of these NIST activities. The ATP and the MEP, which accounted for more than 50% of the FY1995 NIST budget, were proposed for elimination. In 2007, ATP was terminated and replaced by the Technology Innovation Program.[58]

While much of the legislative debate has focused on extramural efforts, increases in spending for the NIST laboratories that perform the research essential to the mission responsibilities of the agency have tended to remain small. As part of the American Competitiveness Initiative, announced by former President Bush in the 2006 State of the Union address, the Bush Administration stated its intention to double funding over 10 years for "innovation-enabling research" done at NIST through its "core" programs (defined as internal research in the STRS account and the construction budget). In April 2009, the President Obama stated his decision to

[58] For additional information on the MEP and TIP programs, see CRS Report RS22815, *The Technology Innovation Program*, and CRS Report 97-104, *Manufacturing Extension Partnership Program: An Overview*, both by Wendy H. Schacht.

double the budget of key science agencies, including NIST, over the next 10 years. While additional funding has been forthcoming, it remains to be seen how support for internal R&D at NIST will evolve and how this might affect financing of extramural programs such as TIP and MEP.[59]

Table 10. NIST

(in millions of dollars)

NIST Program	FY2009 (P.L. 111-8) Actual	ARRA[a] (P.L. 111-5)	FY2010 (P.L. 111-117) Enacted	FY2011 Request
STRS[b]	472.0	220.0	515.0	584.5
TIP/ATP	65.0		69.9	79.9
MEP	110.0		124.7	129.7
Construction	172.0	360.0	147.0	124.8
HIT[d]		20.0		
NIST Total[e]	**819.0**	**600.0**	**856.6**	**918.9**

Sources: NIST website (available at http://www.nist.gov/public_affairs/budget.htm), P.L. 111-8, P.L. 111-5, and Administration's Budget Request.

a. Includes FY2009 and FY2010 funding.

b. Includes funding for the Baldrige National Quality Program.

c. Funding is for the new Technology Innovation Program (TIP) that replaced ATP.

d. Transferred from Department of Health and Human Services for Health Information Technology Initiative.

e. Figures may not add up because of rounding.

National Oceanic and Atmospheric Administration[60]

The National Oceanic and Atmospheric Administration (NOAA) conducts scientific research in areas such as ecosystems, climate, global climate change, weather, and oceans; supplies information on the oceans and atmosphere; and conserves coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[61] The reorganization was intended to unify the nation's environmental activities and to provide a systematic approach for monitoring, analyzing, and protecting the environment.

NOAA's R&D efforts focus on three areas: climate; weather and air quality; and ocean, coastal, and Great Lakes resources. For FY2011, President Obama has requested $949.0 million in R&D funding for NOAA, a 22.0% increase in funding from the FY2010 level of $777.9 million. R&D accounts for 17.1% of NOAA's total FY2011 discretionary budget request of $5.554 billion. The

[59] For additional information on NIST, see CRS Report 95-30, *The National Institute of Standards and Technology: An Appropriations Overview*.

[60] This section was written by Harold F. Upton, Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

[61] "Reorganization Plan No. 4 of 1970," 35 *Fed. Reg.* 15627-15630, October 6, 1970; also, see http://www.lib.noaa.gov/noaainfo/heritage/ReorganizationPlan4.html.

R&D request consists of $522 million for research (55.0%), $251 million for development (26.4%), and $176 million for R&D equipment (18.5%). About $374 million (48%) of the R&D request would fund intramural programs and $399 million (52%) would fund extramural programs.[62]

NOAA's administrative structure has evolved into five line offices that reflect its diverse mission, including the National Ocean Service (NOS); the National Marine Fisheries Service (NMFS); the National Environmental Satellite, Data, and Information Service (NESDIS); the National Weather Service (NWS); and the Office of Oceanic and Atmospheric Research (OAR). In addition to NOAA's five line offices, Program Support (PS), a cross-cutting budget activity, includes the Office of Marine and Aviation Operations (OMAO).

OAR is the primary center for R&D within NOAA. OAR would receive $430.1 million for R&D, 45.3% of the total NOAA FY2011 R&D request and 92.5% of the total OAR request. The OAR request is a 4.5% increase from the FY2010 appropriation of $411.5 million. The OAR R&D total includes $77.1 million for R&D equipment. The President's budget includes $80.8 million for NOS R&D, $12.7 million (18.6%) more than FY2010, and $252.8 million for NESDIS, an increase of $157.8 million (166.1%).[63] NMFS R&D funding would remain nearly unchanged at $69.2 million, a decrease of $1 million (-1.4%). NWS R&D funding would decrease by $9.5 million (26.0%) to $27.0 million. OMAO[64] R&D equipment would be funded at $89.1 million, a decrease of $7.5 million (-7.8%) from FY2010. (See **Table 11**.)[65]

The NOAA FY2011 Budget Summary provides information on its FY2011 R&D funding request by function: ecosystems, 30%; mission support, 30%; climate, 26%; weather and water, 12%; and commerce and transportation, 1%.[66] R&D activities highlighted by NOAA include: developing a dedicated program to produce climate assessments at national and regional scales; sustaining a carbon observation and analysis system; supporting the Earth Observing System to provide climate change data; monitoring of ocean acidification; improving water forecasting services for extreme events such as floods; demonstrating the advantages of using multi-function phased array radar for weather forecasting; and supporting creation of integrated ecosystem assessments.[67]

[62] National Oceanic and Atmospheric Administration, *National Oceanic and Atmospheric Administration FY 2011 Budget Summary*, National Oceanic and Atmospheric Administration, Washington, DC, February 9, 2010, http://www.corporateservices.noaa.gov/~nbo/11bluebook_highlights.html, and [62] Emily Larkin, NOAA Budget Office, personal communication, February 23, 2010.

[63] NOAA, at the direction of the Office of Management and Budget, has included four Joint Polar Satellite System sensors in NESDIS R&D.

[64]NOAA now reports OMAO spending as R&D equipment.

[65] Information used in this paragraph was obtained from Emily Larkin, NOAA Budget Office, personal communication, February 23, 2010.

[66] National Oceanic and Atmospheric Administration, *National Oceanic and Atmospheric Administration FY 2011 Budget Summary*, Washington, DC, February 9, 2010, http://www.corporateservices.noaa.gov/~nbo/11bluebook_highlights.html.

[67] Ibid.

Table 11. NOAA R&D

(in millions of dollars)

NOAA Line Office	FY2009 Actual	FY2009 ARRA	FY2010 Enacted	FY2011 Request
NOS	73.7		68.1	80.8
NMFS	39.6		70.2	69.2
OAR	575.8		411.5	430.1
NWS	33.4	0.5	36.5	27.0
NESDIS	119.2		95.0	252.8
OMAO	113.0		96.6	89.1
Total R&D	**954.7**	**0.5**	**777.9**	**949.0**

Sources: Emily Larkin, NOAA Budget Office, personal communication, February 23, 2010.

a. FY2010 and FY2011 enacted and request columns include R&D equipment for OAR ($73.5 million in FY2010 and $77.1 million in FY2011), NESDIS ($9.5 million in FY2011), and OMAO ($96.6 million in FY2010 and $89.1million in FY2011).

National Aeronautics and Space Administration[68]

The Administration has requested $16.190 billion for NASA R&D in FY2011. This amount would be an increase of 18.3% over FY2010, in a total NASA budget that would increase by 1.5%. (See **Table 12**.) The growing share of NASA's budget devoted to R&D results from a new focus on long-term technology development; increased support for Earth science; and the planned retirement of the space shuttle, which is considered an operational program, not R&D.

For several years, budget priorities throughout NASA have been driven by the Vision for Space Exploration. The Vision was announced by President Bush in January 2004 and endorsed by Congress in the NASA Authorization Act of 2005 (P.L. 109-155) and the NASA Authorization Act of 2008 (P.L. 110-422). Under the Vision, NASA's primary goal is to return humans to the Moon by 2020. In 2009, the Augustine committee conducted an independent review of NASA's human spaceflight activities.[69] The committee found that the program outlined by the Vision would require additional NASA funding of $3 billion per year, even if a return to the Moon were delayed by a few years. The Administration's budget for FY2011 would cancel the Moon program. Under the Administration proposal, NASA's eventual goal would be human exploration of Mars, but in the near term, the International Space Station would be the only destination for human spaceflight that would have a specific schedule.

The Administration request for Exploration in FY2011 is $4.263 billion, a 12.8% increase over FY2010. The activities funded by this account would change significantly. Its main current activity is the Constellation Systems program, which is developing the Orion crew vehicle and

[68] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[69] Review of U.S. Human Spaceflight Plans Committee, *Seeking a Human Spaceflight Program Worthy of a Great Nation*, October 2009, http://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf. The committee that developed this report is known as the Augustine committee after its chairman, Norman Augustine.

the Ares I rocket for carrying humans into low Earth orbit, as well as the heavy-lift Ares V rocket, the Altair lunar lander, and lunar surface systems for the planned Moon mission. The Administration budget for FY2011 would eliminate Constellation Systems. Instead of Orion and Ares I, the proposed budget would provide $812 million to spur development of commercial crew transport services to low Earth orbit. Instead of Ares V and the lunar systems, it would provide $1.551 billion to enable future human exploration by conducting robotic precursor missions and R&D on technologies such as advanced in-space propulsion and in-situ production of oxygen, water, and propellants from lunar and Martian materials.

The Consolidated Appropriations Act, 2010 (P.L. 111-117) prohibits NASA from using FY2010 or prior-year funds to terminate or eliminate "any program, project, or activity of the architecture for the Constellation program" or to create or initiate any new program, project, or activity.[70] Some analysts and policy makers have expressed concern that NASA contracting decisions and other actions during FY2010 may be in violation of the appropriations provision.[71] NASA officials reply that they are continuing the Constellation program during FY2010 in full compliance with the law, even though they intend to terminate the program in FY2011.

The requested $5.006 billion for Science in FY2011 would be an 11.4% increase over FY2010. The largest increase would be for Earth science. This would include $171 million to fund a replacement for the Orbital Carbon Observatory (OCO), which was launched in February 2009 but failed to reach orbit, and $150 million as the first year of a five-year, $2.1 billion global climate initiative. The climate initiative and other increases would accelerate the development and launch of several Earth science missions recommended in 2007 by a National Academies decadal survey.[72]

A new Space Technology program would receive $572 million under the Administration's budget proposal. This program's focus would be technologies that are applicable to multiple missions in the long term, as opposed to components needed for specific systems in the short term. It would seek to advance technologies from the point of early-stage innovation to the demonstration of flight readiness.

The Administration's budget would extend operation of the International Space Station (ISS) to at least 2020. Increased funding would provide for greater utilization of existing facilities, in part by paying the launch costs of non-NASA users of the ISS national laboratory. The first commercial cargo flights to resupply the ISS are scheduled during FY2011.

[70] P.L. 111-117, Division B, Title III.

[71] See, for example, the letter from 27 Members of Congress to NASA Administrator Charles Bolden, February 12, 2010, online at http://www.posey.house.gov/UploadedFiles/LetterToBolden-CancellingConstellation-Feb15-2010.pdf.

[72] National Research Council, *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, 2007, http://www.nap.edu/catalog/11820.html.

Table 12. NASA R&D

(in millions of dollars)

	FY2009 Regular Actual	FY2009 ARRA	FY2010 Enacted	FY2011 Request
Science	$4,503	$400	$4,493	$5,006
Earth Science	*1,377*	*325*	*1,421*	*1,802*
Planetary Science	*1,288*	*—*	*1,341*	*1,486*
Astrophysics	*1,230*	*75*	*1,104*	*1,076*
Heliophysics	*608*	*—*	*627*	*642*
Aeronautics and Space R&T	500	150	507	1,152
Aeronautics Research	*500*	*150*	*507*	*580*
Space Technology	*—*	*—*	*—*	*572*
Exploration	3,506	400	3,780	4,263
Constellation Systems	*3,033*	*400*	*3,325*	*—*
Constellation Transition	*—*	*—*	*—*	*1,900*
Commercial Spaceflight	*—*	*—*	*—*	*812*
Advanced Capabilities	*472*	*—*	*454*	*—*
Exploration R&D	*—*	*—*	*—*	*1,551*
International Space Station	2,060	—	2,317	2,780
Subtotal R&D	**10,569**	**950**	**11,097**	**13,201**
Other NASA Programs[a]	3,907	2	4,084	2,291
Cross-Agency Support[b]	3,306	50	3,095	3,111
Associated with R&D	*2,414*	*—*	*2,262*	*2,651*
Associated with Other	*892*	*50*	*833*	*460*
Construction & Env. C&R[b]	—	—	448	397
Associated with R&D	*—*	*—*	*328*	*339*
Associated with Other	*—*	*—*	*121*	*59*
Total R&D	**12,983**	**950**	**13,687**	**16,190**
Total NASA	**17,782**	**1,002**	**18,724**	**19,000**

Source: NASA FY2011 congressional budget justification, online at http://www.nasa.gov/news/budget/.

Notes: ARRA is the American Recovery and Reinvestment Act (P.L. 111-5).

a. Space Shuttle, Space and Flight Support, Education, and Inspector General.

b. Allocation between R&D and non-R&D is estimated by CRS in proportion to the underlying program amounts (except FY2009 ARRA) in order to allow calculation of a total for R&D. The Cross-Agency Support and Construction and Environmental Compliance and Remediation accounts consist mostly of indirect costs for other programs assessed in proportion to their direct costs.

Department of Agriculture[73]

The FY2011 request for research and education activities in the U.S. Department of Agriculture (USDA) is $2.976 billion, a decrease of $30.9 million (approximately 1.0%) from the FY2010 estimate of $3.007 billion. (See **Table 13**.) The Agricultural Research Service (ARS) is USDA's in-house basic and applied research agency, and operates approximately 100 laboratories nationwide. The ARS laboratories focus on efficient food and fiber production, development of new products and uses for agricultural commodities, development of effective biocontrols for pest management, and support of USDA regulatory and technical assistance programs. Included in the total support for USDA in FY2011 is $1.224 billion for ARS, $51.0 million below the FY2010 estimate. In ARS, the Administration proposes a reduction of $40.0 million in funding add-ons designated by Congress for research at specific locations. The amounts from the discontinued projects are to be redirected to critical research priorities of the Administration that include genetic and genomic databases, domestic and global market opportunities, new varieties and hybrids of feedstocks, animal health and feed efficiency, and new healthier foods with decreased caloric density. The FY2011 budget provides an increase of $3.0 million for improved animal protection to enhance food and production security and an increase of $6.4 million for research on children's nutrition and health. In addition, an increase of $5.0 million has been proposed for research to safeguard food supply by developing and validating sensing technologies for pathogens, toxins, and chemical residues. The Administration does not propose any funding for buildings and facilities in FY2011 for the ARS. The Administration does provide $1.8 million for a review of USDA research facilities. It is anticipated that such a review would serve as a framework for developing a service-wide capital improvement strategy for future investments that parallel program goals.

The National Institute of Food and Agriculture (NIFA), formerly the Cooperative State Research, Education, and Extension Service (CSREES), was established in Title VII, §7511 of the Food, Conservation, and Energy Act of 2008 (P.L. 110-246, also known as the 2008 farm bill). In the FY2011 request, NIFA is focused on larger and longer research efforts that will "... create substantial impacts in addressing critical issues facing the long-term viability of agriculture." NIFA is responsible for developing linkages between the federal and state "components of a broad-based, national agricultural research, extension, and higher education system."[74] NIFA distributes funds to State Agricultural Experiment Stations, State Cooperative Extension Systems, land-grant universities, and other institutions and organizations that conduct agricultural research, education, and outreach. Included in these partnerships is funding for research at 1862 land-grant institutions, 1890 historically black colleges and universities, 1994 tribal land-grant colleges, and Hispanic-serving institutions. Funding is distributed to the states through competitive awards, statutory formula funding, and special grants. The FY2011 request provides $1.500 billion for NIFA, a decrease of $12.0 million from the FY2010 estimate. The NIFA FY2011 budget includes the proposed elimination of $141.0 million in congressional add-ons. Funding for formula distribution in FY2011 to the state Agricultural Experiment Stations is $215.0 million, level with FY2010. One of the primary goals of the President's FY2011 NIFA request is to emphasize and prioritize competitive, peer-reviewed allocation of research funding. Programs are to be designed

[73] This section was written by Christine M. Matthews, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[74] U.S. Department of Agriculture, *U.S. Department of Agriculture FY2011 Budget Summary and Annual Performance*, February 2010, p. 116.

that are more responsive to critical national issues such as agricultural security, local and regional emergencies, zoonotic diseases, climate change, childhood obesity, pest risk management, and development of biofuels that assure agricultural productivity and sustainability. Support is to be given for a competitive program directed at developing training and expanding use of web-based and other technology applications. Funding is provided for programs that improve the quality of rural life and provide stress assistance programs to individuals engaged in agriculture-related occupations. Another focus in the FY2011 request is on programs that support minority-serving institutions and their recipients.

NIFA is also responsible for administering the agency's primary competitive research grants program, the Agriculture and Food Research Initiative (AFRI). The FY2011 request proposes $428.8 million for AFRI, a $166.3 million (63.3%) increase over the FY2010 estimate. In addition to supporting fundamental and applied science in agriculture, USDA maintains that the AFRI makes a significant contribution to developing the next generation of agricultural scientists by providing graduate students with opportunities to work on research projects. A focus of these efforts is to provide increased opportunities for minority and under-served communities in agricultural science. AFRI funding is to support projects directed at developing alternative methods of biological and chemical conversion of biomass, and research on the impact of a renewable fuels industry on the economic and social dynamics of rural communities. The Administration proposes support for initiatives in agricultural genomics, emerging issues in food and agricultural security, the ecology and economics of biological invasions, and plant biotechnology. Research is proposed that moves beyond water quality issues to extend to water availability, reuse, and conservation.

The FY2011 request for USDA provides $87.2 million for the Economic Research Service (ERS), $5.2 million above the FY2010 estimated level. ERS supports both economic and social science information analysis on agriculture, rural development, food, and the environment. ERS collects and disseminates data concerning USDA programs and policies to various stakeholders. Funding for the National Agricultural Statistics Service (NASS) is proposed at $164.7 million in the FY2011 request, $2.9 million (1.8%) above FY2010. The budget includes support to improve research efforts in analyzing the impacts of bioenergy production, and to examine concerns pertaining to feedstock storage, transportation networks, and the vagaries in commodity production. Additional research areas include production and utilization of biomass materials; stocks and prices of distillers' grains; and current and proposed ethanol production plants. Funding for NASS is to allow for the restoration of the chemical use data series on major row crops; post harvest chemical use; and alternating annual fruit, nuts, and vegetable chemical use. Also, funding is provided to support the second year of the 2012 Census of Agriculture's five year cycle. Data from the Census of Agriculture is to be used to measure trends and new developments in the agricultural community.

ARRA provided $176.0 million for ARS buildings and facilities; these funds are characterized as funding for R&D facilities.

Table 13. U.S. Department of Agriculture R&D

(in millions of dollars)

	FY2009 Actual[a]	FY2009 ARRA	FY2010 Estimate	FY2011 Request
Agricultural Research Service				
Product Quality/Value Added	$103.0		$105.0	113.0
Livestock Production	80.0		81.0	85.0
Crop Production	199.0		208.0	220.0
Food Safety	106.0		108.0	114.0
Livestock Protection	75.0		79.0	83.0
Crop Protection	198.0		204.0	213.0
Human Nutrition	79.0		86.0	91.0
Environmental Stewardship	220.0		228.0	240.0
National Agricultural Library	23.0		22.0	23.0
Repair, Maintenance, and Other Programs	84.0		83.0	42.0
Subtotal	**1,167.0**		**1,204.0**	**1,224.0**
Buildings and Facilities	47.0	176.0	71.0	0.0
Total, ARS	**1,214.0**	**176.0**	**1,275.0**	**1,224.0**
National Institute of Food and Agriculture (NIFA)[b]				
Hatch Act Formula	207.0		215.0	215.0
Cooperative Forestry Research	28.0		29.0	29.0
Earmarked Projects and Grants	128.0		111.5	0.0
Agriculture & Food Research Initiative	202.0		262.5	428.8
Federal Administration	19.0		45.1	14.5
Higher Education Programs[c]				
	43.0		56.5	61.9
Other Programs	64.0		72.9	94.2
Total, Research and Education Activities[d]	**691.0**		**792.5**	**843.4**
Extension Activities				
Smith-Lever Sections 3b&c	288.0		297.5	297.5
Extension and Integrated Programs	38.0		38.0	42.7
1890 Colleges, Tuskegee, & West Virginia State University Colleges	86.0		44.4	44.4
Other Extension Programs	62.0		115.0	94.6
Total, Extension Activities	**474.0**		**494.9**	**479.2**
Integrated Activities	57.0		60.0	24.9
Mandatory Programs	127.0		140.9	152.9
Total, NIFA[d]	**1,349.0**		**1,488.3**	**1,500.3**

	FY2009 Actual[a]	FY2009 ARRA	FY2010 Estimate	FY2011 Request
Economic Research Service	80.0		82.0	87.2
National Agricultural Statistics Service	152.0		161.8	164.7
Total, Research, Education, and Economics	**2,795.0**		**3,007.1**	**2,976.2**

Sources: U.S. Department of Agriculture, *FY2011 Budget Summary and Annual Performance Plan*.

Notes: Research activities carried out in support of Homeland Security are reflected under the Food Safety, Livestock Protection, and Crop Protection program areas, including $64.3 million in FY2009.

a. Funding levels are contained in the U.S. Department of Agriculture FY2011 Budget Summary and Annual Performance Plan, February 2010. USDA received approximately $28.0 billion from the American Recovery and Reinvestment Act, 2009 (ARRA). Included in that total was $176.0 million for ARS facilities.

b. Formerly CSREES. NIFA was established in Title VII of the 2008 Farm Bill.

c. Higher Education includes capacity building grants, Hispanic-Serving Institution Education Grants Program, Two-Year Postsecondary, and Agriculture in the K-12 Classroom, Higher Education Challenge Grants, Improve the Quality of Life in Rural America, and others.

d. Program totals may or may not include set-asides (non-add) or contingencies.

Department of the Interior[75]

President Obama has requested $812.8 million for Department of the Interior (DOI) R&D in FY2011, an increase of $27.5 million (2.3%) above FY2010 funding of $785.3 million. (See **Table 14**.) The U.S. Geological Survey (USGS) is the primary supporter of R&D within DOI, accounting for approximately 84% of the department's total FY2010 R&D appropriations.

President Obama has proposed $679.2 million for USGS R&D in FY2011, an increase of $18.6 million (2.8%) above the estimated FY2010 level. USGS R&D is conducted under several activity/program areas: global change, geographic research, geological resources, water resources, biological research, and enterprise information.

Global climate change R&D would receive the largest boost in the USGS R&D budget, rising $13.9 million (23.9%) to $72.1 million in FY2011 under President Obama's budget request.

USGS geographic research efforts seek to describe and interpret America's landscape by mapping the nation's terrain, monitoring changes over time, and analyzing how and why these changes have occurred. President Obama's FY2011 budget for geographic research R&D proposes a $6.5 million increase (113.8%) to $53.7 million.

Funding for USGS geological resources R&D in the FY2011 request includes $227.2 million, an increase of $5.1 million (2.3%) from its estimated FY2010 level. The Geological Resources Program assesses the availability and quality of the nation's energy and mineral resources. The Geological Resources Program researches, monitors, and assesses the landscape to understand geological processes to help distinguish natural change from that resulting from human activity. Within the Earth sciences, the USGS plays a major role in important geological hazards research,

[75] This section was written by John F. Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

including research on earthquakes and volcanoes. Enterprise Information conducts information science research to enhance the National Map and National Spatial Data infrastructure.[76]

USGS water resources R&D is focused on water availability, water quality and flood hazards. President Obama's FY2011 budget for water resources R&D proposes a $3.2 million decrease (2.6%) to $123.9 million.

USGS biological research efforts seek to generate and distribute scientific information that can assist in the conservation and management of the nation's biological resources. President Obama's FY2011 budget request for biological research R&D proposes a reduction of $3.6 million (1.8%) to $201.3 million. The USGS Biological Research program serves as DOI's biological research arm, using the capabilities of 17 research centers and associated field stations, one technology center, and 40 cooperative research units that support research on fish, wildlife, and natural habitats. Major research initiatives are carried out by USGS scientists who collect scientific information through research, inventory, and monitoring investigations. These activities develop new methods and techniques to identify, observe, and manage fish and wildlife, including invasive species and their habitats.

Enterprise information R&D would be cut by $0.1 million (9.4%) in FY2011 under the President's budget.

In past years, the Department of the Interior had not reported R&D funded through the Fish and Wildlife Service. For FY2011, DOI has added the Fish and Wildlife Service to its R&D calculations and asked the FWS to count their R&D activities for previous years. According to DOI, this was prompted by the addition of $10 million for global change research funding for FWS in FY2009, and the President's request for $15 million in FY2011. The R&D funding data for FWS is included, together with other DOI agencies, in **Table 14**.

Table 14. Department of the Interior R&D

(in millions of dollars)

	FY2009 Actual	FY2009 ARRA	FY2010 Enacted	FY2011 Request
U.S. Geological Survey	614.8	74.4	660.6	679.2
Geographic research	45.6		47.2	53.7
Geological resources	215.8		222.0	227.2
Water resources	126.4		127.1	123.9
Biological research	185.3		204.9	201.3
Global change	40.6		58.2	72.1
Enterprise information	1.0		1.1	1.0
Bureau of Land Management	11.0		11.0	11.0
Bureau of Reclamation	12.8		12.8	15.2

[76] For additional information see CRS Report RL33861, *Earthquakes: Risk, Detection, Warning, and Research*, and CRS Report R40625, *Geospatial Information and Geographic Information Systems (GIS): Current Issues and Future Challenges*, both by Peter Folger.

	FY2009 Actual	FY2009 ARRA	FY2010 Enacted	FY2011 Request
Minerals Management Service	36.5		44.9	46.2
National Park Service	33.0		35.3	35.5
Fish and Wildlife Service	10.6		20.8	25.8
Total, DOI R&D[a]	**718.7**	**74.4**	**785.3**	**812.8**

Source: CRS analysis of unpublished data provided to CRS by the Department of the Interior budget office, March 4, 2010, unless otherwise noted.

a. Totals may differ from the sum of the components due to rounding.

Environmental Protection Agency[77]

The U.S. Environmental Protection Agency (EPA), the regulatory agency responsible for carrying out a number of environmental pollution control laws, funds a broad portfolio of R&D activities to provide the necessary scientific tools and knowledge to support decisions relating to preventing, regulating, and abating environmental pollution. Beginning in FY2006, EPA has been funded within the Interior, Environment, and Related Agencies appropriations bill. Most of EPA's scientific research activities are funded within the agency's Science and Technology (S&T) appropriations account. This account is funded by a "base" appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account. These transferred funds are dedicated to research on more effective methods to clean up contaminated sites.

The President's FY2011 budget request of $871.2 million for the EPA S&T account, including transfers from the Superfund account, is $1.7 million (about 0.2%) below the FY2010 appropriation of $872.9 million,[78] but $54.7 million (nearly 7%) above the FY2009 appropriation of $816.5 million.[79] The amount included in the FY2011 budget request for the EPA's S&T account represented 8.7% of the total $10.020 billion requested for the agency overall for FY2011 As indicated in **Table 15** below, the base requested funded for the S&T account is a slight increase above the FY2010 level. The $24.5 million proposed transfer from the Superfund account for FY2011 is $2.3 million less than the $26.8 million transferred in FY2010, accounting for the overall decrease from FY2010 levels. However, as indicated in EPA's budget justification,[80] the requested base amount for the S&T includes both increases and decreases of varying levels for the individual EPA research program and activity line items identified within

[77] This section was written by Robert Esworthy, Specialist in Environmental Policy, CRS Resources, Science, and Industry Division.

[78] Title II of P.L. 111-88, the Interior, Environment, and Related Agencies appropriations for FY2010. For information on FY2010 funding for all EPA appropriations accounts see CRS Report R40685, *Interior, Environment, and Related Agencies: FY2010 Appropriations*.

[79] P.L. 111-8, Omnibus Appropriations Act, 2009. Title VII of Division A of the American Recovery and Reinvestment Act of 2009 (P.L. 111-5, signed into law February 17, 2009) included a combined total of $7.22 billion for EPA, but did not include funding for activities within the agency's S&T appropriations account. For information on FY2009 funding for all EPA appropriations accounts see CRS Report RL34461, *Interior, Environment, and Related Agencies: FY2009 Appropriations*.

[80] *FY 2011 Annual Performance Plan and Congressional Justification (EPA's Proposed Budget): Science and Technology*, http://www.epa.gov/ocfo/budget/.

the account when compared with the enacted FY2009 appropriations. For some activities, the amount requested for FY2011 remained relatively flat compared to the prior year appropriation.

Areas within the S&T account for which increases have been requested for FY2011 include: clean air research, global change research, and clean water research. FY2011 requested funding for other areas, such as air toxics and quality and human health and ecosystem research, reflects both increases and decreases when compared to FY2010 appropriations. For example, the $256.2 million requested for human health and ecosystem research is $7.8 million above the FY2010 level. Requested funding within this program area includes: $17.3 million for the Science to Achieve Results (STAR) fellowships, a $6.4 million (nearly 60%) increase above FY2010 appropriations; $17.4 for Endocrine Disruptor Research, a $6.0 million increase; and $21.9 for Computational Toxicology research, a $2.1 million increase. The total within this program activity also includes: $80.1 Human Health Research, $3.9 below FY2010 levels; and $74.0 million for Ecosystem Research, a $1.6 million reduction. The largest requested decrease for FY2011 within the S&T account was for EPA's homeland security activities.[81] The $51.3 million requested for FY2011 is nearly $15.0 million (22.6%) below the FY2010 appropriation of $66.3.

The activities funded within the S&T account include research conducted by universities, foundations, and other non-federal entities with EPA grants, and research conducted by the agency at its own laboratories and facilities. R&D at EPA headquarters and laboratories around the country, as well as external R&D, is managed primarily by EPA's Office of Research and Development (ORD). A large portion of the S&T account funds EPA's R&D activities managed by ORD, including the agency's research laboratories and research grants. The account also provides funding for the agency's applied science and technology activities conducted through its program offices (e.g., the Office of Water). Many of the programs implemented by other offices within EPA have a research component, but the research is not necessarily the primary focus of the program.

The EPA S&T account incorporates elements of the former EPA Research and Development (R&D) account, as well as a portion of the former Salaries and Expenses, and Program Operations accounts, which had been in place until FY1996.[82] Because of the differences in the scope of the activities included in these accounts, apt comparisons before and after FY1996 are difficult. Although the Office of Management and Budget (OMB) reports[83] historical and projected budget authority (BA) amounts for R&D at EPA (and other federal agencies), OMB documents do not describe how these amounts explicitly relate to the requested and appropriated funding amounts for the many specific EPA program activities. The R&D BA amounts reported by OMB are typically significantly less than amounts appropriated/requested for the S&T

[81] Under the Bioterrorism Act of 2002, and Homeland Security Presidential Directives 7, 9, and 10, EPA is the lead federal agency for coordinating security of the Nation's water systems, and plays a role in developing early warning monitoring and decontamination capabilities associated with potential attacks using biological contaminants.

[82] EPA's most recent annual appropriations have been requested, considered, and enacted according to eight statutory appropriations accounts established by Congress during the FY1996 appropriations process.

[83] The Office of Management and Budget (OMB) reports R&D budget authority (BA) amounts in its Analytical Perspectives accompanying the annual President's budget, but amounts for specific programs are not included. For example, for EPA R&D, OMB reported actual BA of $559 million for FY2009, estimated BA of $622 million for FY2010, and $651 million proposed for FY2011. The R&D budget authority amounts reported by OMB are typically significantly less than amounts appropriated/requested for the S&T account. This is an indication that not all of the EPA S&T account funding is allocated to R&D. See OMB, *Fiscal Year 2011 Budget of the United States: Analytical Perspectives – Special Topics/Research and Development pgs. 339-344*, http://www.whitehouse.gov/omb/budget/fy2009/.

account. (BA as reported by OMB is included in **Table 15** below for purpose of comparison.) This is an indication that not all of the EPA S&T account funding is allocated to R&D.

The operation and administration of the agency's laboratories and facilities necessitate significant expenditures for rent, utilities, and security. Funding for these expenses represented slightly less than 9% of the total S&T account in the FY2011 request, roughly the same as the FY2008-FY2010 appropriations. Prior to FY2007, a significant portion of the funding for these expenses had been requested and appropriated within EPA's Environmental Programs and Management (EPM) appropriations account. This change affects comparisons of the S&T appropriations over time. For example, the majority of operation and administrative expenses were funded within the EPM account in FY2006 and prior fiscal year appropriations. Funding provided within the S&T account for these expenses represented less than 1% of the total S&T appropriation for FY2006 and prior fiscal years.

Some Members of Congress and an array of stakeholders have continually raised concerns about the adequacy of funding for scientific research at EPA. The adequacy of funding for EPA's scientific research activities has been part of a broader question about the adequacy of overall federal funding for a broad range of scientific research activities administered by multiple federal agencies. Some Members of Congress, scientists, and environmental organizations have expressed concern about the downward trend in federal resources for scientific research over time. The debate continues to center around the question of whether the regulatory actions of federal agencies are based on "sound science," and how scientific research is applied in developing federal policy.

Table 15. Environmental Protection Agency S&T Account

(in millions of dollars)

Environmental Protection Agency	FY2009 Enacted (P.L. 111-8)	FY2010 Enacted (P.L. 111-88)	FY2011 Request
Science and Technology Appropriations Account			
—Base Appropriations	*$790.1*	*$846.1*	*$846.7*
—Transfer in from Superfund Account	*26.4*	*26.8*	*24.5*
Total Science and Technology	**$816.5**	**$872.9**	**$871.2**
R&D Budget Authority Report by OMB	*$559.0*	*$622.0 est.*	*$651.0 est.*

Source: Prepared by CRS. The FY2009 and FY2010 appropriation are from the Conference Report (H.Rept. 111-316 , accompany the FY2010 Interior, Environment and related Agencies appropriations (P.L. 111-88)). FY2011 requested amounts are from *U.S. Environmental Protection Agency FY2011 Annual Performance Plan and Congressional Justification,* http://www.epa.gov/ocfo/budget.). Numbers may not add due to rounding.

Department of Transportation[84]

President Obama has requested $1.022 billion for Department of Transportation (DOT) R&D in FY2011, an increase of 0.5% above the FY2010 enacted level. (See **Table 16**.) Two DOT

[84] This section was written by John F. Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

agencies—the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA)—account for most of the department's R&D funding (approximately 84% in FY2010).

The President has requested $400.4 million for FAA R&D and R&D facilities, a decrease of $11.3 million (2.7%) from the FY2010 enacted level. Most of the substantial changes in FAA R&D funding are related to the agency's Next Generation Air Transportation System (NextGen) program which seeks to address challenges posed by air traffic growth by increasing the nation's airspace capacity and efficiency and by reducing emissions and noise. Changes requested for NextGen R&D funding include: elimination of funding for demonstrations and infrastructure ($33.8 million); a reduction of $5.9 million for environmental research on aircraft technologies, fuels and metrics; and increases of $28.9 million for system development, $4.9 million for air-ground integration, $2.4 million for alternative fuels for general aviation, and $1.7 million for self-separation. In addition, the agency's proposed budget includes a reduction of $13.0 million for advanced technology development and prototyping.[85]

President Obama has requested no increase in R&D funding for the FHWA, proposing $442.0 million for FY2011, identical to the agency's funding for FY2010, both in aggregate and for each specific activity area.[86] According to the agency's budget request:

> The Administration is developing a comprehensive approach for surface transportation reauthorization, which includes [research, development, test, and evaluation (RDT&E)]. Consequently, the Budget contains no policy recommendations for programs subject to reauthorization [which includes R&D], including Federal-aid highways.
>
> Instead, the Budget displays baseline funding levels for all surface programs. Future authorizations for RDT&E with the Federal-aid highway program may include activities associated with deployment of safety initiatives, a restructured infrastructure program, and a variety of activities associated with environmental improvement and streamlining, security improvements, and outreach and dissemination.[87]

Table 16. Department of Transportation R&D

(in millions of dollars)

	FY2009 Actual	FY2010 Estimate	FY2011 Request
Federal Highway Administration[a]	431.6	442.0	442.0
Federal Aviation Administration[b]	362.2	411.6	400.4
Other agencies[c]	180.3	163.3	180.0
Total, DOT R&D[d]	**974.1**	**1,016.9**	**1,022.4**

Source: DOT FY2011 agency budget justifications; unpublished tables provided by OMB to CRS in February 2010; and private communications between OMB and CRS.

Notes: N/A = not available

[85] Federal Aviation Administration, U.S. Department of Transportation, *Budget Estimates Fiscal Year2011*, February 2010.

[86] Federal Highway Administration, U.S. Department of Transportation, *Budget Estimates Fiscal Year2011*, February 2010.

[87] Ibid.

a. Federal Highway Administration, U.S. Department of Transportation, *Budget Estimates, Fiscal Year FY2011, Federal Highway Administration*, February 2010, http://www.dot.gov/budget/2011/budgetestimates/fhwa.pdf.

b. Federal Aviation Administration, U.S. Department of Transportation, *Budget Estimates, Fiscal Year FY2011, Federal Aviation Administration*, February 2010, http://www.dot.gov/budget/2011/budgetestimates/faa.pdf; private e-mail correspondence with the Office of Management and Budget dated February 19, 2010.

c. "Other agencies" includes National Highway Traffic Safety Administration, Federal Railroad Administration, Federal Transit Administration, Research and Innovative Technology Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and the Office of the Secretary. Figures derived from FY2011 agency budget justifications and unpublished tables provided by OMB to CRS in February 2010.

d. Totals may differ from the sum of the components due to rounding.

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